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# TORBENSEN DRIVE

## Internal Gear

### *AN ENDORSEMENT EXTRAORDINARY*



(Chicago Daily News Fleet of 16 Republic Trucks All Equipped with TORBENSEN DRIVE)

Of all commercial delivery service, that of a daily newspaper is the most exacting. It must be quick and absolutely dependable at all times.

Deliveries must be rushed to all parts of the city to reach dealers, to meet street cars and to catch trains right on the minute—or service to the public is crippled, with injury and loss to the publisher.

In order to leave nothing to chance, the Chicago Daily News were careful to see that their delivery fleet, consisting of sixteen Republic Trucks, were all equipped with the TORBENSEN DRIVE.

Specify TORBENSEN DRIVE for your own truck. Let us send you full description, details and list of trucks using the TORBENSEN DRIVE as standard equipment.



## TORBENSEN GEAR AND AXLE COMPANY

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CLEVELAND,

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# BOSTON MOTOR TRUCK SHOW

*March 4-11, 1916*

## THE BOSTON SHOW EDITION OF MOTOR TRUCK

**Will Be Mailed February 25**

The Boston Exhibition will be the only show of motor trucks of national importance of the year.

The entire section of the country from which this show will attract visitors is covered by the ***Motor Truck*** practically to the exclusion of all other publications devoted to highway transportation.

Publicity in this edition will reach every interest, it will be complete publicity for one expenditure, and circulation will not be duplicated.

*The last form will close February 21.*

THE MOTOR TRUCK  
TIMES BUILDING

PAWTUCKET, R. I.

# The MOTOR TRUCK

*Devoted to Motor Driven Business  
Vehicles of all Classes*

Pawtucket, R.I.

Vol. VII. No. 1. JANUARY, 1916.

## HEAVY HAULAGE BY MOTOR TRUCK TO CONTRACT.

**Equipment Increased From One to Five Five-Ton Machines, Serving Two Concerns, Affording Services That Very Generally Replace Freight and Express Shipments in a 40-Mile Radius, with Two More Ordered for Third Firm.**

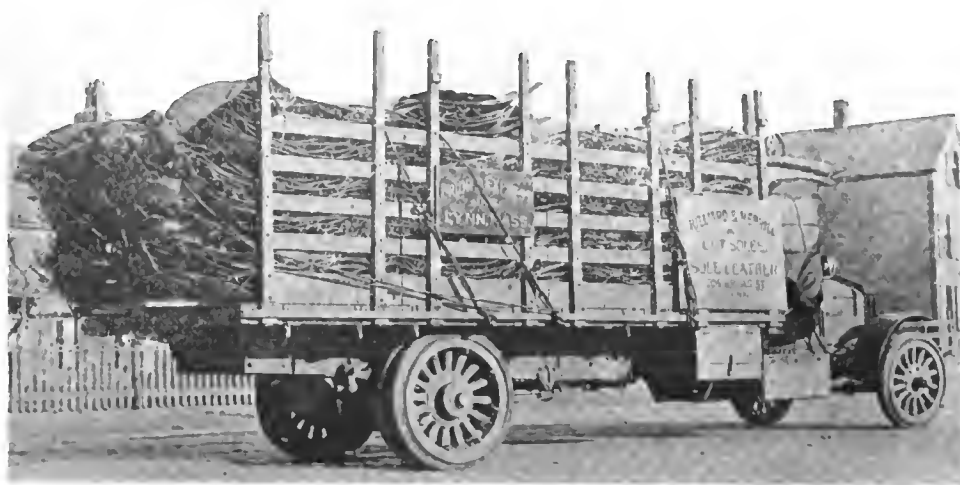
**H**IGHWAY transportation cost in Boston and its suburbs is greater than in any other city of similar size in this country, and probably in the world, because of the operating conditions resultant largely from the location and from the peculiar layout of the streets. Were the Bostonian to compare haulage costs with those found in other municipalities, he would be astonished by the additional price that is paid for the failure of the city to establish direct thoroughfares and the continuance of what much resembles a cobweb of narrow and crooked streets in the "city proper," or what is in reality the old city, which is now given over to business.

Those who operate horse equipment and have studied the possibilities for motor trucks, realize that every condition in the city is unfavorable for street traffic. The street congestion is very great, many streets are so narrow that vehicles are allowed to move in but one direction, in most of them shipments and deliveries must be made across the sidewalks with wagons and trucks wholly or partly obstructing the

roadways, and the traffic from north of the Charles river, and from south of Fort Point channel and South bay is concentrated on a few bridges and into several streets that are used by practically all conveyances, entering, leaving or crossing Boston.

In suburban Boston and the surrounding cities and towns the conditions are much better and the streets are generally wide and well laid out. Haulage into and from the business section of Boston, however, especial-

ly that part in which the wholesale firms are usually located, is costly in the point of time required, for the traffic moved very slowly. Boston and its suburbs have the services of a approximately 400 different express companies be-



Pierce-Arrow Five-Ton Truck with a Load of 1000 Hides of Leather from Freight House for Hillard & Merrill Factory.

sides those engaged in what may be termed heavy haulage, these affording local, suburban, state, interstate and national transportation, and besides these there are those who may be referred to as contractors—they undertaking highway haulage of any kind, by the day, week, month or job, or furnishing horses, carts and drivers to those who require occa-

sional or irregular work and do not maintain equipment of their own.

### The Possibilities of Contract Haulage.

One may assume that the competition is very keen, and so it is, but there are very large possibilities for those who will study the conditions and the needs, and will apply practical methods and direct the work so as to obtain the largest degree of economy. The purpose of this article is to describe the development of a contract haulage enterprise in which large motor trucks are used exclusively. This concern is Prior's Express, Inc., which is nominally with headquarters at Lynn, and which is directed by Roscoe H. Prior, who inaugurated it about 3½ years ago. This company now has five five-ton Pierce-Arrow trucks in service and two more machines have been contracted for which will be delivered as quickly as possible.

Mr. Prior was agent for the sale of pleasure automobiles at Eau Claire, Wis., where he was located for several years. He disposed of his business in 1911 and went to Boston with no determined plans. Because of his knowledge of motor vehicles he gave attention to

chines in efficient condition mechanically.

He determined that haulage contracting offered the best possibilities, provided there was sufficient work to keep a truck busy, and sought an opportunity for engaging in such a business. While long hauls are known to be the most profitable, Mr. Prior made a proposition to Hilliard & Merrill, Inc., manufacturer of leather soles for shoes, which had what might be considered as extremely short hauls for a part of its work, and comparatively long hauls for the remainder. The company is located at 206 Broad street, Lynn, and the hides are either received in cars at the railroad yard at West Lynn, about 1¼ miles distant, or hauled from the stores of the United States Leather Company and the W. F. Mosser Company in Boston, both about 12½ miles distant. The railroad shipments are usually made from the tanneries and the hides are piled flat in the cars. The hides hauled from the stores in Boston are generally rolled, each roll weighing from 250 to 300 pounds.

In the manufacture of shoe soles the leather is cut into strips of different widths and more time is required at the cutting machines to handle rolled leather, and there is more wastage, so that so far as possible the hides are obtained flat. But as these must be handled singly, more time is required than with the roll leather. The company received its hides at the freight yard and hauled these to the factory, and the finished sole stock was hauled to the freight house. Hides were hauled from Boston to Lynn and the cut soles were hauled to that city and delivered to the rail-



Special Built and Equipped Bodies Were Necessary for Leather Haulage, but Are Equally Serviceable for Other Purposes.

the possible uses of motor trucks for general transportation and he observed and studied the conditions generally. He concluded that competing with the established services was not well advised. There was no question that progressive business men would avail themselves of opportunities to economize transportation cost, although many hesitated to replace horse equipment with motor trucks.

### Why Trucks Were Not Economical.

He believed that many owners, because of the lack of practical knowledge of motor vehicles, did not find trucks economical. Instead of studying conditions and endeavoring to utilize the machines so that there would be minimum idle time and maximum service or moving time, the men directing the drivers and the work done by them simply continued methods that were traditional or had been customary with animals. That is to say, that a horse wagon or cart was replaced by a motor truck and no endeavor was made to hasten the loading and unloading, or to select routes that were reasonably free from traffic, or to keep the ma-

road and water terminals. For this haulage horses had been used for years.

The company considered the proposition and rejected it. The economy appeared to be reasonably certain, but there was no desire to displace employees that had served the concern faithfully. Mr. Prior continued his study of transportation methods and nearly a year later the company, having become convinced that there was no reason to longer expend money unnecessarily for haulage, made contract with him to do the work in Lynn and between Lynn and Boston. There were other possibilities, however, which both Mr. Prior and the company had in mind.

### Made Shipment to Its Customers.

The company's principal customers are in Haverhill, Brockton, South Braintree, Rockland, Marlboro and Boston. Haverhill is 26 miles from Lynn, Brockton 33, South Braintree 21, Rockland 30 and Marlboro 28 miles. These are large factories that utilize large quantities of stock constantly. Deliveries in Lynn and vicinity were at that time made by animal wagons

and truck, but the shipments to the places named, aside from Boston, were made by express, or, in some instances, by freight. Leather is valuable and the shoe manufacturers prefer to have continuous shipments rather than have occasional deliveries of large volume, as this obviates the need of tying up capital, carrying additional insurance, as well as other charge, and makes possible taking advantage of favorable changes in the leather market.

Naturally, the shoe manufacturers desire to carry on business with the smallest stock on hand that is practical, and for this reason the deliveries were made at very brief intervals. By freight or express what might be regarded as considerable time for so short distances was required for freight or express shipments from the Lynn factory. Stock shipments for Brockton, for instance, would be taken to the freight house at Lynn, and if not delayed would be sent out that night. The next day it would be received at Boston and if transferred quickly would be sent out the same evening. The third day it would arrive in Brockton and unloaded, and possibly sent to the factory, or it might be a day later. From three to four days was fairly good time for freight shipments, and express deliveries would be made in possibly 24 hours, but the freight was much the cheaper.

#### **Began With One Truck.**

Mr. Prior stated the possibilities of making deliveries with the truck where freight and express service were then used, this giving a tailboard delivery from the factory to the customers, and saving the labor of handling, as well as the time. This, however, was a matter for future development.

The first Pierce-Arrow truck was delivered to Mr. Prior in August, 1912, and he hired a driver, his purpose being to supervise and direct the work at the factory and freight yard. The truck was equipped with a crate body with high side stakes to carry the loose hides, and it was provided with a tarpaulin cover that was folded and carried on the top of the cab when not in use. This was necessary from the fact that water will greatly damage leather and it cannot be exposed to the rain without serious loss. A truck load of loose hides is approximately 1000, and as these must be handled singly and placed flat in loading and unloading, much time was necessarily given over to handling. While the round trip from the factory to the railroad yard is but  $3\frac{1}{2}$  miles, three loads a day was found to be all that could be hauled, despite the endeavor to expedite the work. The truck hauled the cut soles from the factory to the freight house and after delivery returned with the hides.

During the period that animal trucks were used

they were backed to the front of the factory for unloading or loading, which necessitated opening the doors while the work was going on, this chilling the first floor of the building in cold weather, and in storms great care was required to protect the leather. Mr. Prior wanted to conserve the time of his machine and the driver, and so he built a wooden one-story building 12 feet wide on a vacant strip of land beside the factory. This is such length that it will hold one truck with its load, and beyond this is a fire door and a platform the height of the deck of the truck and the first floor of the factory. This is closed in front by folding doors.

This structure serves as a loading and unloading platform and a garage. At night a truck is stored in it. During the day the truck can be backed into the building and loaded and unloaded quickly in perfect shelter and the handling minimized, and at night with the fire door closed the factory is securely cut off from the machine. The street in front of the garage and the factory was soft and muddy, and Mr. Prior had a sur-



**Loading Three Five-Ton Pierce-Arrow Trucks at M. O'Keeffe's Railroad Freight House at Charlestown for Delivery from 10 to 40 Miles Distant.**

facing of crushed stone spread on it so that the truck could be worked quickly and without stresses when approaching or leaving the factory.

This all dealt with the short hauls, but in the long hauls between Boston and Lynn the truck was so superior to horses and wagons that there was no question whatever. As stated, the rolls of leather weigh from 250 to 300 pounds each. The largest number ever taken over the road from Boston to Lynn was 80, and this was done with a team of 16 horses. The contractor, however, stated that he would never undertake such a work again, because the length of the trip and the weight, which approximated 11 tons when the rolls are averaged at 275 pounds each, was too much for horses to endure.

The average load of leather rolls for the truck is from 50 to 60, and these will weigh, with the allowance of 275 pounds to the roll, from 13,750 to 16,500 pounds. The greatest load that has ever been carried over the road by a truck is 75 rolls, and this, on the stated basis of weight, would be about  $10\frac{1}{4}$  tons.

The shipments from the Lynn factory to the differ



ent shoe manufacturers are now made with great economy of time and handling. The round trip from Lynn to Brockton is 66 miles, and this work has been done twice in a single day, showing a mileage of 132 miles and, of course, serving the shoe manufacturers better than they were ever before served. This obviates all need of haulage from local freight houses to the shoe factories, supplies stock whenever it is wanted and insures against all possible delays.

Any of the customers can be supplied with any grade or volume of stock up to two truck loads a day to meet any given condition, but of course this is a volume that has not as yet been required. When the trucks return from Rockland, Brockton and South Braintree they are generally driven through Boston, where loads of hides and materials can be taken on and carried to the Lynn factory. Whenever possible loads are obtained when the trucks are returning to Lynn, the purpose being to reduce the number of dead or unproductive miles so far as this can be done and to increase the number of productive miles covered by the machines.



Load of Groceries Such as Are Hauled from Boston to Chain Stores Beyond the Horse Delivery Zone, at a Decided Saving of Freight Charges.

While the trucks that are operated between the Hilliard & Merrill factory and the factories of the shoe manufacturers are always fully loaded one way, they are not always freighted returning unless loads for Lynn can be taken on at different points, and Mr. Prior has devoted considerable time to developing business that can be hauled. That is, he serves several firms that have haulage from Boston and notify him to do this for them. This work, however, is incidental and cannot be depended upon to justify a regular service for such customers.

Mr. Prior worked with one truck until the autumn of 1913, when he ordered a second machine of the same capacity, which was delivered to him in November of that year. At that time the work for Hilliard & Merrill had so increased that there was use for this machine a considerable part of the time and with other orders for haulage the truck was worked to capacity. By constantly supervising the work of the trucks and interesting the customers in the necessity of quick handling the freights as they were delivered, he found

that he could conserve the time of the machines so that the unloading could be quickly done, and he educated his drivers to work rapidly.

#### Grocery Store Stock Distribution.

By the winter of 1914 Mr. Prior believed there was work to be had for the third truck, and this was ordered and delivered in February, 1914. At that time he made a contract with M. O'Keefe, Inc., that now operates a chain of about 350 small grocery stores in and about Boston. This concern had a warehouse at that time in Richmond street, Boston, and hauled its stock from the different railroad freight houses and terminals in Boston and vicinity to the warehouse and distributed it to the stores in Boston and its suburbs by horse truck. The company then had a horse equipment that required about 90 animals to operate.

Its methods were to take stock from the receiving points in Boston to the warehouse and there to make up the different orders for the stores and send them out as required, making deliveries within a radius of 10 miles by its own vehicles according to the needs. The supplies for the

stores beyond this radius were either shipped by freight or express, this necessitating delivering the goods at the different express offices or freight houses in Boston, and the haulage of the freight shipments from the local freight yards to the stores. This was expensive in a sense, but the limit had been reached for horse haulage.

#### Tailboard Delivery to Stores.

Mr. Prior made a proposition to take the stock from the warehouse direct to the stores, and save handling at freight houses and the time, at a price that

was undoubtedly an economy, and with a contract for continuous work for one truck this haulage was begun. The third truck was ordered with a transmission gearset that could be adapted for the installation of a power winch, but the winch was not installed.

The city of Lynn has for several years been extending its water works system and it was then laying a main pipe 36 inches diameter. It had purchased a truck to haul this pipe, which was received at a dock in that city and from that terminal hauled and placed along the highway where it was to be laid. This truck carried two sections of pipe, weighing six tons, and hauled another section on a specially built trailer. The work progressed faster than this machine could deliver the pipe and Mr. Prior was asked if he could haul it, a power winch being absolutely necessary to raise the sections on skids to the truck platform and lower them to the ground.

#### Truck Worked Day and Night.

As the third truck was fitted for the installation of a winch and this could be supplied quickly, a contract

was made. The winch was fitted and this truck was sent to Lynn and one of the others was diverted to M. O'Keeffe's service. There was all the work that could be done with three trucks in the contract haulage outside of the transportation of the pipe, but the engineers of the water department were willing that this work be done at night. This gave Mr. Prior the three trucks during the days, and the machine with the winch was worked steadily day and night for three months. In that time the truck was never in a garage. It hauled leather from 7 in the morning until 5 in the afternoon, and then it hauled pipe until 7 the next morning, being worked by two crews, aside from Sundays.

Meantime the delivery for M. O'Keeffe increased, and with new stores and other expansion a fourth truck was necessary, which was ordered and delivered in August, 1915. The service of Hilliard & Merrill then required two machines practically all of the time, and the experience with the economies of contract haulage with the first truck used for grocery store supply delivery, which was operated between the warehouse and a considerable number of stores beyond the 10-mile radius, was such that Mr. O'Keeffe decided to include all his places of business within a zone represented by the 20 and 10-mile radii.

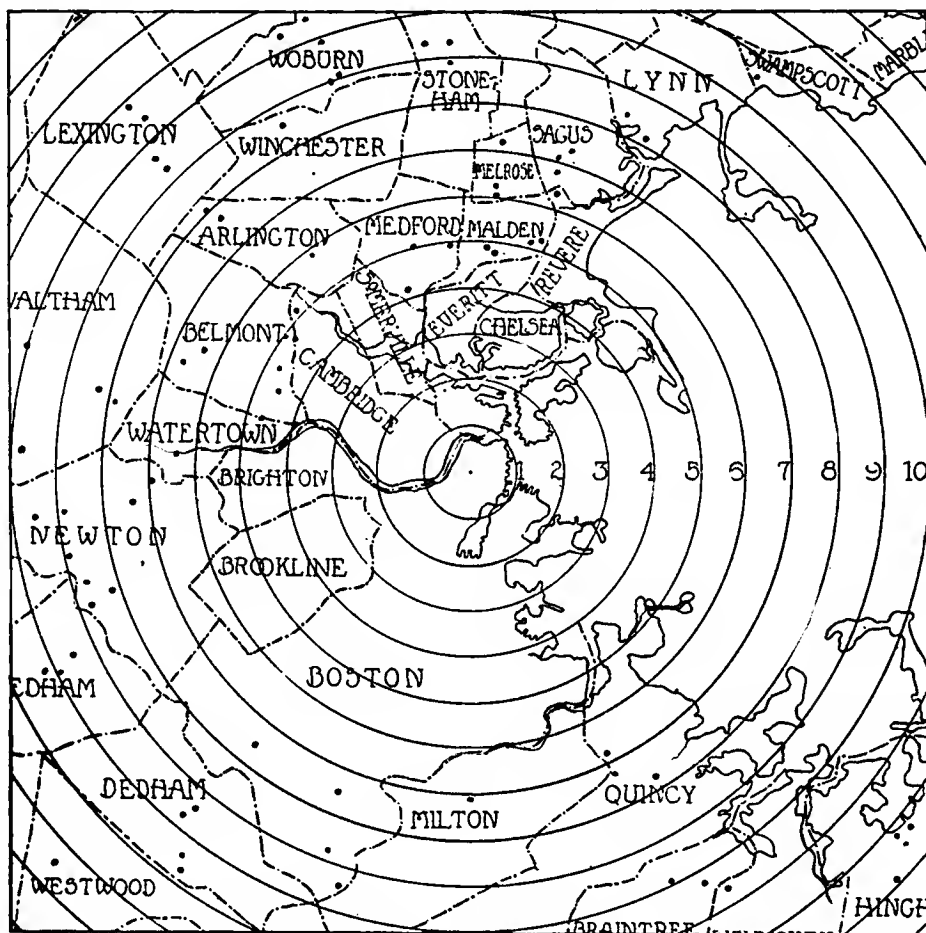
With the fourth truck in service the distribution of supplies to the stores within this zone was of necessity systematized carefully. This was required by Mr. Prior to make a profit from his machines and by Mr. O'Keeffe to make the deliveries at minimum cost. The trucks were worked on routes so that they could make two trips a day, always carrying capacity loads, and the distribution was so arranged that practically all of the freight and express shipments from the warehouse ceased.

#### Time Lost by Congested Traffic.

But in loading at the warehouse much time was lost not only by the trucks, but by the horse wagons and drays, because of the street congestion in its immediate vicinity which prevented the vehicles being handled quickly when approaching and leaving, and by the limited space at which the freights could be loaded and unloaded. Instead of all wagons and trucks being located upon arrival, waits were often necessary before they could be brought to the platform, and handling was retarded by the accumulations close to the entrances. Not only this, the streets of that sec-

tion of the city are filled with traffic during the business hours of the day, and progress to and from the warehouse was materially delayed.

This condition was studied by Mr. Prior and he pointed out to Mr. O'Keeffe the economies that could be obtained by a warehouse located so that there would be ample loading space for the trucks and wagons and where the shipping department had floor space to work and a sufficient number of entrances so that internal handling would be minimized. Mr. O'Keeffe became interested and after observing the shipping and the traffic he was convinced that there were large possibilities for economy, which could be worked out to decided advantage with his horse vehi-



The 10-Mile Radius from the State House, Boston, Which Is the Limit of Delivery by Horses of One Load a Day for the M. O'Keeffe Stores.

cles as well as the trucks.

#### Use Freight House for Warehouse.

Accordingly he recently leased a section of a freight house in Rutherford avenue, Charlestown, which is reached by the tracks of the Boston & Maine railroad, and he is now utilizing this as a warehouse, receiving the freight directly from the cars and taking it from the freight house to his stores instead of transferring the shipments to a warehouse. This saves two handlings and at least one short haul, and with 16 entrances and abundant platform room the vehicles can be loaded much more quickly. By systematizing the loading the time of the men, wagons and trucks is very largely economized.

The lease of the freight house was a very great



progression economically. While all of the supplies for the stores are not received there, for some reach Boston by water and by other lines, and these must be handled more, this is probably as logical a solution as could be made unless there was one combined shipping and railroad terminal.

#### Delivery Extended to 40-Mile Radius.

But Mr. O'Keeffe was not satisfied with this. He is constantly extending his chain of stores, and so he made a proposition to Mr. Prior to transport supplies by truck within a radius of 45 miles of Boston, and plans are now making so that this system will be developed as rapidly as is possible. To cover the routes that have been planned Mr. Prior ordered a fifth truck, which was delivered Jan. 14, and with this the deliveries are made to the stores, usually two routes a day being covered, which include Gloucester, Haverhill, Newburyport, Maynard, Concord Junction, Hudson, Marlboro, Taunton, Whittenton Junction, Weir Vil-

veloped by experience. There is also reason to believe that with the present facilities the use of animal wagons and trucks will be further restricted. Just now three trucks are at work for this service, and two are handling the haulage for Hilliard & Merrill.

#### Contract for Brick Distribution.

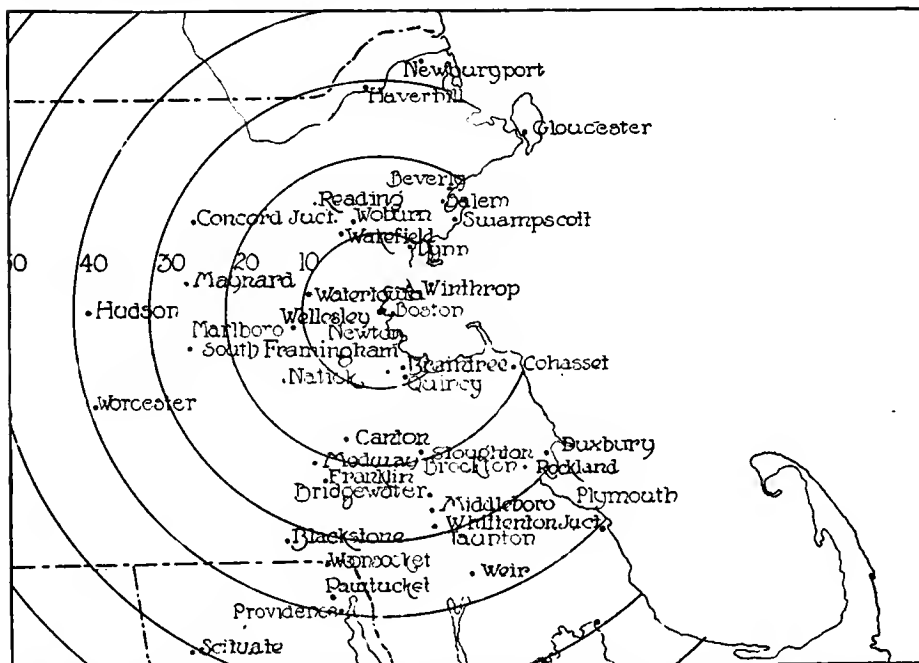
Mr. Prior has not confined his contracting to any particular classes of business, and is willing to undertake any work that will afford a reasonable profit. He has just made contract with the New England Brick Company, Cambridge, to supply two trucks for the exclusive service of that concern, and has ordered two more five-ton Pierce-Arrow machines equipped with hydraulic hoists and dumping bodies, which will be placed in service as soon as they are delivered. The contract is to furnish the trucks and drivers and haul the brick at prices that will be based on 1000 brick and the mileage. The company is now making its deliveries by other vehicles, and after studying the work Mr.

Prior submitted a proposition that was accepted. The plan is for the trucks to carry loads of 3000 brick and to haul these to Boston and the surrounding towns and cities, the estimate being five round trips a day. This means that each truck will handle an average of 15,000 brick daily.

The operation of the trucks will be directed by Mr. Prior. He will, of necessity, systematize the manner of working them and he will have to be governed by the conditions for loading and delivery. There is no definite policy other than efficiency and economy, that will insure a profit, and as every minute of the time of the trucks and the men he employs have a substantial value, he will endeavor to utilize them with the least possible loss. But the system and the character of supervision must be determined by experience.

#### Does Not Maintain Garage.

Contrary to the prevailing policies of haulage contractors, Mr. Prior does not maintain a garage. In the combination loading shed and garage at the Hilliard & Merrill factory at Lynn one truck is kept. Another is stored in a Lynn garage close to the sole manufactory. The three in use in Boston are kept in a garage at Charlestown during the severe winter weather, but until the temperature became very cold at night the trucks were returned by the drivers to the freight house in Rutherford avenue, backed to the platform, and were left for the night, so that they would be in readiness for loading in the morning. There is probability that this will be resumed when the weather becomes warmer. Provision has not as yet been made



The 10-Mile Zones Outside of the Territory Served by Horses for Which a Contract Haulage Service Is Afforded by Prior's Express for M. O'Keeffe, Inc., with Three Trucks, Obviating Freight and Added Haulage, and Giving a Tailboard Delivery.

lage, Franklin, Medway, Plymouth, Duxbury, Cohasset, Scituate, Bridgewater, Middleboro Blackstone, Quincy, Canton, Stoughton, Natick, Wellesley, South Framingham, Wakefield, Reading, Lynn, Swampscott, Salem, Beverly, Winthrop, Woburn and other towns and cities. There is some probability that this service will be extended to Worcester and to Providence, Pawtucket, Woonsocket and other Rhode Island communities.

Just how far this distribution can be made economically from the point of view of Mr. O'Keeffe is somewhat uncertain, but certain it is that he purposes to use trucks for haulage just as far as he can do so. Beyond that radius he will adopt other means of shipping and handling, although there is probability of establishing one or more receiving points and following the same system from these. The solution must be de-

for the trucks that will be used for brick haulage. Possibly a garage will be established after the two machines have been received, either in Cambridge or Charlestown, but this is a matter for future consideration.

The machines are not spared, for they are worked hard as compared with thousands of trucks in other services, but they are driven carefully, and Mr. Prior's supervision and experience has been a very large business asset to him. Whatever is necessary in the way of mechanical care and attention is always given, and nothing that might result in abnormal deterioration is neglected. When the first truck had been in service for three years it was overhauled, and of a bill for about \$230 approximately \$180 was for labor, and the remainder was for replacement of parts, one of the principal items being for new bushings for the spring eyes. The ordinary adjustments are made by the drivers under the direction of Mr. Prior, and some of the minor repairs, but whenever work of consequence is necessary this is done at the service station of the J. W. Maguire Company, agent for the Pierce-Arrow Motor Car Company.

#### Some of the Economies.

With reference to the economy of the machines, the service of Hilliard & Merrill, Inc., could be but in small part done by animal vehicles. The trucks have taken the place of all other forms of transportation and economized time and labor, as well as actual expense, to say nothing of better serving the company's customers. What has been accomplished cannot be measured by comparisons of cost.

The saving to M. O'Keeffe, Inc., both in handling and the freight and express charges, is sufficient to justify the continuance of the service on a constantly increasing scale, and the real value of the business expansion possible from this quick and direct distribution cannot be accurately estimated.

The contractor in this service becomes a specialist in transportation, who seeks from every angle to increase efficiency and to economize operating cost, because he cannot obtain variable prices, and the haulage is on a basis of tonnage. The business man has placed at his disposal first class equipment, well directed and carefully supervised workers, and he can figure to a cent what any given work will cost. He makes no initial investment and can depend upon a standard of transport at a less cost than he could if he owned and operated his own service.

From the viewpoint of the contractor, one of the conditions that must be dealt with very carefully is the handling. Even with the shipping department extremely efficient there may be delays when deliveries are made, due in some part to the limited help in the stores and receiving rooms or to the unwillingness of the men to work quickly to release the trucks. Improvement can only be brought about by thorough interest and co-operation of those for whom the work is done, who can provide means for hastening the re-

moval of the freights. With the earnings depending on the basis of tons hauled, and without reference to time, idleness of trucks must be effectually guarded against if profit is to be obtained from them. And careful upkeep and maintenance is absolutely necessary.

#### TRUCKS FOR TRAVELLING SHOWS.

In the days before the railroads came circuses and shows used to travel from town to town in horse drawn wagons, and there is great likelihood that many of them may revert to that system, substituting motor trucks for horse wagons through dissatisfaction with railroad charges which the managers feel have been unwarrantably increased.

C. W. Parker, who controls many carnival companies, travelling merry-go-rounds and similar enterprises, as well as manufacturing them for sale to others, has paid the railroads \$686,500 a year for moving his travelling entertainments from place to place. He has declared that he will utilize trucks for transportation at once if the railroads do not make him more satisfactory terms.

#### THE MOTOR TRUCK MARKET.

As a gauge of the possible motor truck market, H. S. Daniels of the Kissel Motor Car Company, Hartford, Conn., points out that there are 26,000,000 horses and mules in the country. It would take 6,500,000 trucks to supplant them all, but if only 2,000,000 of them were supplanted this would require 500,000 trucks.

In 1910 there were about 10,000 trucks in use in the United States and this number has now been increased to 100,000. Business men are beginning to realize that if they desire to keep up with competition they must use trucks, and this is constantly making sales easier to negotiate.

#### MOTOR TRUCK AWAKENING.

There has been a great awakening among the owners of transportation and delivery systems regarding the economy of motor trucks and Charles T. Jeffery, president of the Thomas B. Jeffery Company, Kenosha, Wis., believes that the European war and the remarkable service that trucks have afforded there is largely responsible for the greater interest of business men in power transportation. Never before has a new mechanical device received such an extensive and such an attention-compelling demonstration, and American truck makers are reaping the benefits in their domestic market.

Seymour de Benneville Keim has been appointed manager of the branch of the Locomobile Company of America in New York City. He has been in charge of the Philadelphia branch for several years.

## FEDERAL GOOD ROAD AID.

### Senator Gore Advocates that Nation and States Unite In Highway Building.

Speaking at a dinner of the National Automobile Chamber of Commerce during the New York automobile show, Senator Gore of Oklahoma, the blind statesman, delivered an enthusiastic tribute to the industry and expressed his opinions on many questions affecting it.

He said he favored a tariff commission to gather facts on tariff schedules for the use of both parties in Congress, not to take the tariff out of politics, but to make the facts plain so that the various schedules adopted could be understood by the public and any juggling could be detected.

He said that American shipping should be encouraged. He urged federal participation in good road work on the basis of a dollar of federal money for every dollar of state money, which, he said, would keep the appropriations out of the pork barrel class.

"It has been estimated by experts that every time the sun sets the American farmer has lost \$1,400,000 on account of the unimproved and neglected condition of the highways. This aggregates more than \$500,000,000 a year. What investment would not be justified to eliminate this waste?

"More than \$200,000,000 a year are now being spent by the state governments and their sub divisions. Expenditure at this rate, if wisely and efficiently made, will soon produce a magnificent system of roads covering the whole country."

To cover the expense of \$25,000,000 worth of federal road work a year the senator urged an inheritance tax. If the money were used as interest on road bonds it would make \$500,000,000 available for the construction of roads. He said the automobile was revolutionizing rural life and that the truck was destined to have an even greater effect upon it.

### WANT STANDARDIZED TRUCK RATING.

Standardization of truck ratings is a subject that is constantly receiving more attention from manufacturers of machines and it is likely that the N. A. C. C. will be urged to take up the matter shortly. As ratings are now made there is a variation sometimes as great as a ton in the advertised load capacities of two trucks of almost similar specifications, while the horse-powers claimed will vary as much as 20 per cent. under the same conditions.

The American Rotary Valve Company announces that it has discontinued the production of electric motors, press drives and vacuum cleaners and will in the future devote itself exclusively to the manufacture of universal joints.

## AMERICAN TRUCK OPPORTUNITY.

The United States consul at Teneriffe, which is in the fruit and vegetable district of the Canary Islands, reports that there are now railways or other means of transportation there and that the produce is taken to the ports by carts and six-mule teams. The business is in the hands of substantial companies who are already interested in the possible use of motor trucks for this work, as well as being favorably disposed toward American trucks through their acquaintance with American passenger cars. He believes that a company that cultivated the field, selected a strong representative and provided service facilities, would reap a big harvest in sales.

Roads are being rapidly improved in the Dominican republic according to the report of the consul at Puerto Plata, and the railroads are getting in such condition since the war began that their use is becoming very difficult. There were no motor vehicles there in 1912, but now there are about 50 and more are on order, including several trucks. There is a demand for repair facilities.

The bureau of foreign and domestic commerce has detailed information concerning these opportunities.

### BIG DEMAND FOR BOSTON SHOW SPACE.

Every inch of space in the Mechanics' building in Boston has already been contracted for by Boston show exhibitors, although the show is still two months ahead. There are scores of passenger car, commercial car and accessory manufacturers clamoring for a chance to exhibit. It has become necessary for Manager Chester I. Campbell to consider the advisability of leasing another building.

Boston is the only one of the large cities where trucks will be exhibited. The entire lower floor at the coming show will be given up to trucks. The demand for truck space has crowded out a number of passenger car exhibitors who formerly made exhibition at Boston.

Paul Revere hall, which has always been devoted entirely to accessories, has been taken entirely by pleasure car exhibitors. The demand for accessory space has been larger than ever before. A month after the books were opened all of the space was taken.

### TRUCKS AT SAN PEDRO FORTIFICATIONS.

Six-ton motor trucks are hauling the material that is being used in the construction of fortifications that are now building to protect San Pedro, which is the harbor of Los Angeles. The trucks carry the material from the wharves to the site of the fort, and a six-ton truck arrives every 15 minutes during the eight hours of the day, making 32 loads, or 180 tons of materials, that are used daily.

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**MOTOR ACCIDENT RATIO LESS.**

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**Fewer Fatalities Resulting for Automobile Vehicles in Proportion to Their Number.**

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Figures made public by the census bureau and based on the compilations of the National Automobile Chamber of Commerce concerning the number of the motor cars in use, indicate that the number of fatal accidents resulting from the use of motor cars has increased far less rapidly than the increase in the number of motor cars. Cars, in other words, are driven much more carefully than they were a few years ago.

At the close of 1909 there were 200,000 motor cars in use in the United States. At the end of 1913 the number had risen to 1,270,000, and at the end of 1914 the total was 1,750,000. In 1909 the number of deaths due to automobile accidents in the death registration area, which at that time covered 56 per cent. of the United States, was 632, against 2628 in 1914. The increase from 1913 to 1914 in the death registration area, which was then 65 per cent. of the United States, was from 2488 to 2795.

This indicates that an increase of 775 per cent. in the number of automobiles in five years was accompanied by an increase of only 315 per cent. in automobile fatalities; and a one year increase of 38 per cent. in the number of cars was accompanied by a 12 per cent. increase in fatalities.

The bureau believes that one cause of this proportional decrease in fatalities lies in the fact that the average car nowadays is driven less miles a year than were the early cars. The improvement in automobile construction, the greater skill of drivers and the better traffic arrangements also undoubtedly are large factors.

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**NEW EDISON BULLETIN.**

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A new bulletin on the use of the Edison nickel-iron-alkaline battery in commercial vehicle service has been issued by the Edison Storage Battery Company, Orange, N. J. The bulletin enumerates some of the qualities which make for the superiority of the electric vehicle over the gasoline and discusses the improved simplicity, durability and reliability that may be secured by using the Edison battery.

The bulletin is illustrated with pictures of trucks made by practically all the manufacturers and used in a great diversity of services. It shows the results of accidents through which trucks have passed without damage to the batteries. The booklet is well illustrated and handsomely printed.

John N. Willys of the Willys-Overland Company and Henry B. Joy, president of the Packard Motor Car Company, have been elected to the board of directors of the Wabash railroad. This railroad reaches both Toledo and Detroit.

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**TRUCK INDUSTRY EXPANDING.**

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**Influence of the Increased Market Will Be for Permanent Development.**

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The great effects of the European war on the truck industry are obvious enough, namely, the remarkable demonstration of efficiency made by the military equipment, which stimulated the American market, and the rising cost of horses, which had much the same effect, together with the general revival of business.

These two factors together have, however, created a third, which will have extremely important bearing on the future growth of the industry—a development which will be permanent. The large war orders for trucks, in conjunction with increased domestic business, has enabled numerous truck makers for the first time to organize their factories for large scale production.

This has reduced vehicle prices despite the very high material markets. The reduction of prices has in turn extended the markets. If this market continues to grow for a year or more, as it seemingly will, when material costs again return to normal, there can, and probably will be, another heavy cut in truck prices.

This will again extend the market and establish the business firmly on a large scale basis. The result will be that the cost of truck operation will probably be cut so far below that of horse hauling on most jobs that animal equipment will be recognized everywhere as obsolete.

It is probably impossible that truck construction will ever reach the same stage of standardization that the passenger car manufacture has reached. One reason for this is that the variety and sizes of the trucks demanded will always be more numerous than the designs and types of passenger cars. Pleasure vehicles are built for five and seven passengers as touring cars, and with two and three passenger capacity as roadsters, usually adapted to the five passenger vehicle chassis.

Trucks at the other hand must always range from the light machine for a load of a few hundred pounds up to the heavy truck with capacity of six tons or more.

But in the main the truck industry is following the line of development which has already been followed by the passenger cars. Simplification and elimination of parts can be noted in all the new designs, and there has been a marked tendency to reduce weight.

The National Acme Manufacturing Company of Cleveland, O., has increased its capitalization from \$2,000,000 to \$9,000,000, to take over the business of the Windsor Machine Company of Windsor, Vt. The purchase involves the payment of \$1000 each for the Windsor company's 3250 shares of outstanding stock.

## LEE SIDE-DUMPING HAND-OPERATED TRUCK BODY.

**Q**UICK discharging equipment is sought by the owners of trucks that are used for the transportation of bulk materials, especially those of a loose character, such as coal, sand, gravel, slag or broken stone, or those that are plastic, such as tar concrete or



**The Lee Two-Way, Side-Dumping Body on a Jeffery "Quad," Showing the Position for Loading and Hauling.**

asphalt, or that have fluidity, such as newly-mixed concrete. All of these are generally used, save the first named, for construction, and very frequently they must be hauled to the work. Where excavation is done, or where materials are prepared at a central plant or yard, means for quick loading are often provided, and the time of the vehicles can be economized by utilizing such bodies as can be discharged without labor.

The initial cost of body equipment is secondary, for the saving of the time of the truck and the driver or crew will in a comparatively short time equal the investment. From that point on the economy is constant through the period the machine is in service.

Three types of bodies are adapted to quick discharging, and these may be differentiated as tipping, elevating and bottom dumping, the purpose with each design being to so place the load that it may be carried out of the body by its own weight. Of the three, the bottom-dumping is the cheapest to construct, but its uses are correspondingly limited. The elevating body may be built to have end or side discharge, but both end and side outlets cannot be had in the same body unless with chutes, and time is sacrificed handling them. The end dumping body is more generally used, because this is the type best known, and side discharging equipment is comparatively unknown.

### **The Lee Two-Way, Side-Dumping Body.**

The Thomas B. Jeffery Company, Kenosha, Wis., builder of the 3000-pound load capacity truck known as the Jeffery "Quad," is now equipping its machines with a body that will discharge a load at either side, distributing it over a larger area than when an end dis-

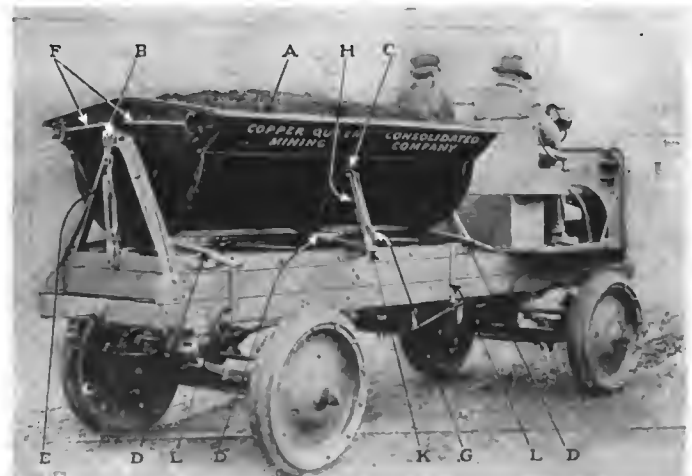
charging body is used. This body is known as the Lee, and it is an adaptation of the principle of the Lee unloading machines that are designed for economizing the time of vehicles used for hauling the freights of railroad cars, or for preparing loads during the absence of the trucks or carts from the work, and which will almost instantly transfer these loads to the transports when they return.

The principle is to mount a steel body so that it is suspended at either end in a frame, in which it can be swung easily, and the load dumped at either side at the desire of the driver. The Lee unloaders are mounted on wheels so that they may be transported from place to place, and the capacities vary with those of the vehicles with which they are used, some of the largest taking five tons or more. These are placed beside a car or bins or conveyors and are filled by shovellers, the number depending upon the length of the haul and the time available for loading.

### **Has Principles of Portable Unloader.**

The Lee quick discharging body equipment for Jeffery trucks is built to utilize the principles of the portable unloader so far as is desirable, but it is mounted on the chassis of the truck in such a manner that the load is equally distributed. On the frame is placed a bolster frame of wood to strengthen the chassis and to carry the steel fittings on which is installed the hopper-like, straight-end body. This body is so well illustrated that there is not need of extended description, but the reader should understand that there is what may be stated as a hopper and flareboard form that is carried on three heavy steel channels that extend from edge to edge around it, and from the lower edges of the flareboard sections is 180 degrees of a circle.

There are heavy flanges for the channels, and into these channels are fitted three cross rails mounted on the frame. The body can be rolled on these rails from side to side, and it is so well balanced that a very light



**The Lee Side-Dumping Body and the Chassis Fittings Designated by Letter for Descriptive Purposes.**



leverage will tip the body so that the contents may be dumped at either side clear of the wheels. The body is free to roll to the extreme dumping positions, but is retained by chains from rolling beyond them, the chains being secured to eyes in the body and in the frame. At either end of the body is a standard or bracket with a latch that will hold the body in an upright position, and at either side in the centre is a latched brace that further supports the body and effectually prevents rolling or swaying or buckling.

#### Body Rolled on Rails by Levers.

The equipment is known as the Lee two-way, side-dumping body, and, as may have been assumed, it is operated manually by releasing the latches and by the use of swinging levers that may be extended beyond the sides of the chassis. The labor incident to dumping is very slight and statement is made that a driver can leave his seat and discharge a load in 30 seconds, and that this work can be done in even less time by a man who has experience with the body. With such an



The Lee Body Rolled so That the Load Is Discharged Clear of the Wheels—This Can Be Done from Either Side of End.

installation the mechanical complications incident to a power hoist are obviated and this is a considerable item of initial as well as operating economy, while there is really no need of attention aside from occasional oiling, and this more to insure against rusting, as the body is necessarily exposed to the weather.

The accompanying illustrations show the Lee body in service, beginning with loading by gravity from a clam-shell bucket and hauling and dumping a load. The second illustration has the different parts of the body installation and the means of operating it designated by letter for the purpose of description. By referring to this one will note that the body A is secured in an upright position by a catch B at the rear, and there is a similar catch at the front end. At either side is an eccentric catch, defined as C, and the three cross rails on which the body rolls are specified as D.

#### Light Pressure Will Dump the Load.

These rails are so formed that they slope from the centre line of the chassis toward either side, and at the ends of the rails are hooks which serve as the final



The Lee Side-Dumping Body with the Latches Released and Swung Preparatory to Rolling on the Rails.

pivoting points when the body is being discharged. Dumping the truck body is done as follows: The handle G (in the middle of the body) is raised, this releasing the eccentric stop on the side that is to be lowered. The support or brace H is now free to be swung outward, so the driver pulls the handle G toward him, the support or brace H being dropped and left hanging downward from the hinge K. The driver then takes the handle E and pulls it sideways, one way or the other, which releases the catch or latch B. As both the end latches are connected by a longitudinal rod, this movement of the handle E releases both simultaneously.

The body is then free to be dumped, and it is rolled on the rails by swinging out one of the handles F, and pressing downward on it until the body rolls on the rails, the distance it rolls being limited by the length of the restraining chains attached to the body and the frame. In ordinary work the driver will dump the body and roll it back with practically one operation, but to obtain an unobstructed picture he walked from the rear to the front of the body when the fifth photograph shown was made.

After the body has been rolled back to its normal



The Interior of the Body, the Sides Having a Form That Insures Discharge of the Load by Gravity.

or upright position, the side support or brace H and the latch B are replaced, the front and rear latches being operated at one motion as before, by use of the handle E or a similar handle at the front of the body.

The construction of the equipment is substantial, it is extremely simple, and it cannot deteriorate with use. It is also comparatively light, which is an important factor with any truck body, because power must be had to carry the load and this can only be obtained by the consumption of fuel.

### PACKARD BUYS AVIATION FIELD.

A large tract of land on Lake St. Clair, near Mt. Clemens, Mich., has been purchased by the Packard Motor Car Company of Detroit as an aviation field. Aeroplanes will be received within a month and experiments with the new Packard aeroplane motor, which the company is designing, will be begun at once. The new motor will be a 12-cylinder, built to a design somewhat similar to that of the automobile motor produced by the company. The company anticipates the development of aero touring and the field is to be equipped as a landing place for tourists with hangars, repair shops and a supply station. The company does not contemplate at present the construction of complete aeroplanes, but merely the perfection of motors for aeroplane use.

### LIBRARY ADOPTS TRUCK SERVICE.

For the delivery of books and supplies to the 30 reading rooms and branch libraries, the Boston Public Library has purchased a number of 1½-ton trucks. These were bought from an express company whose proprietor becomes superintendent of the service. The trucks replace horse service which was hired, and they are expected to greatly reduce cost and promote efficiency.

### AUTOCAR COMPANY DIVIDEND.

The Autocar Company of Ardmore, Penn., declared a five per cent. dividend on its common stock that was payable Dec. 31. This is the first cash dividend the company has declared for a number of years. The directors also voted that \$400,000 of the surplus be converted into permanent capital and additional stock to that value has been issued.

### ADDITIONS TO FISK PLANT.

Additions to the plant of the Fisk Rubber Company at Chicopee Falls, Mass., have been built which give the company 29 acres of factory floor space. There are 20 buildings in all and one of the new ones is the largest single factory structure in western New England. The recent additions include a handsome administration building with sumptuous offices.

### INCREASE OF GASOLINE PRICES.

The following table shows the increase of prices of gasoline in various parts of the country between April 1 and Dec. 31, 1915. The United States geological survey has reported that the production was larger in 1915 than ever before, the exports smaller than in 1914, and that the largest supplies of crude oil that have ever existed are held in reserve:

	Dec. 31	April 1	Inc.
	Cts.	Cts.	Cts.
Atlanta, Ga.....	21.0	12.5	8.5
Boston, Mass.....	22.0	13.0	9.0
Buffalo, N. Y.....	18.0	12.0	6.0
Chicago, Ill.....	16.5	10.5	6.0
Cleveland, O.....	15.0	11.0	4.0
Detroit, Mich.....	16.0	10.5	5.5
Fort Worth, Tex.....	19.0	10.0	9.0
Kansas City, Mo.....	15.8	9.8	6.0
Los Angeles, Cal.....	15.0	12.0	3.0
Minneapolis, Minn.....	16.5	11.5	5.0
Nashville, Tenn.....	16.0	10.0	6.0
New York, N. Y.....	22.0	12.0	10.0
New Orleans, La.....	17.5	11.0	6.5
Norfolk, Va.....	18.0	12.0	6.0
Omaha, Neb.....	15.0	10.0	5.0
Philadelphia, Penn.....	20.0	11.0	9.0
Portland, Me.....	22.0	13.0	9.0
Portland, Ore.....	15.5	12.0	3.5
St. Louis, Mo.....	15.9	9.9	6.0
St. Paul, Minn.....	16.5	11.5	5.0
San Francisco, Cal.....	15.0	11.5	3.5
Santa Fe, N. M.....	25.5	17.5	8.0
Seattle, Wash.....	14.0	12.0	2.0

### LONG DISTANCE TRUCK FREIGHTING.

The embargo on freight which several railroads entering New York found it necessary to declare as a result of the congestion of export shipment, caused a number of Philadelphia shippers, who usually send their freight by the Pennsylvania railroad, to send it to New York by motor truck. During the embargo George W. Mink has operated several five-ton Pierce-Arrow trucks between Philadelphia and New York. The trucks call at the places of shipment for the goods and deliver them direct to the destinations in either city.

### EDISON PROMOTES SUTCLIFFE.

Paul Sutcliffe has been appointed advertising manager of the Edison Storage Battery Company, Orange, N. J. He first joined the Edison interests in 1912, upon his coming east from California, where he obtained his early advertising and selling experience. At the end of a year he left to become secretary of the W. S. Hill Advertising Agency of Pittsburg. For the past year he has been in the advertising department of the Edison company.

### CHASE APPOINTS PRODUCTION MAN.

The Chase Motor Truck Company, Syracuse, N. Y., has appointed Charles A. Durie its production manager. He will assume the position Feb. 1. Mr. Durie has been in charge of final assembly at the Chase plant and has been a member of the organization for four years.



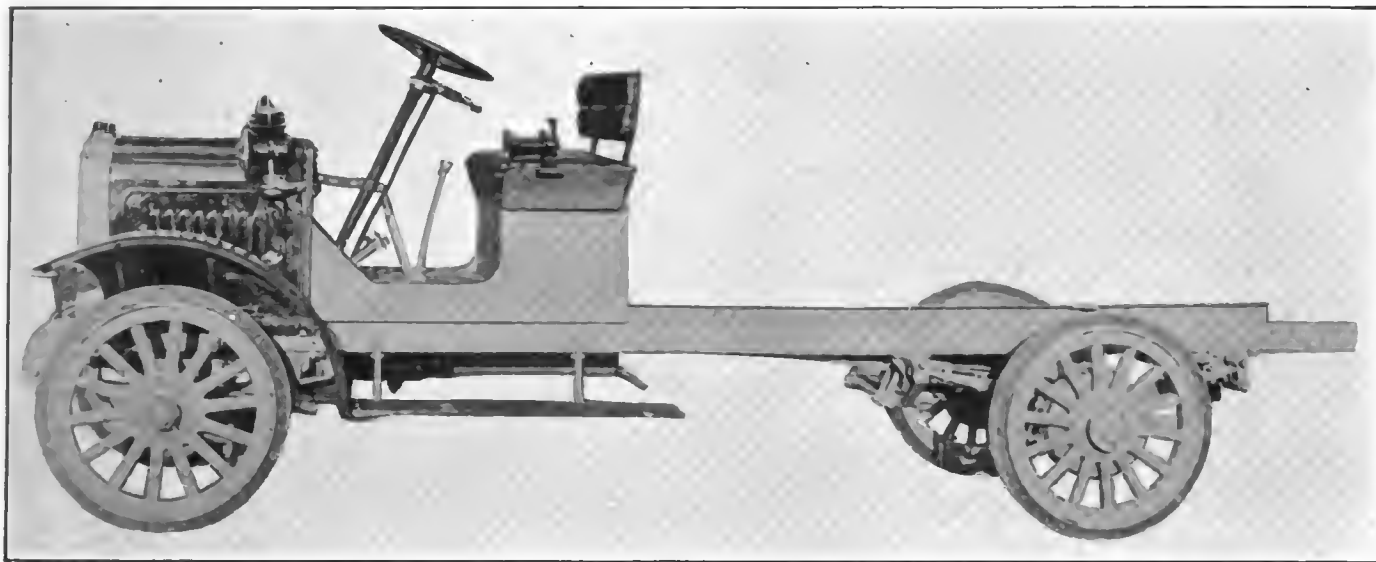
## THE SERVICE 2000-POUND WORM-DRIVEN TRUCK.

THE series of Service trucks, built by the Service Motor Truck Company, Wabash, Ind., has been completed by the production of a machine of 2000 pounds capacity, which is now being constructed commercially. The company now builds machines of 2000, 3000, 4000, 7000 and 10,000 pounds load capacity, which in a general way may be said to meet practically all requirements for highway transportation, save with freights of abnormal size. The company has manufactured trucks for more than five years and it has perfected a design which is practically standardized for the four larger types, and the latest vehicle has been developed with a view of meeting the requirements of those whose delivery is in a large area and must consequently have comparatively light and fast machines.

The Service trucks are all constructed from com-

tortion. The engine is a four-cylinder, four-cycle, L head, water cooled type, with bore of  $3\frac{1}{2}$  inches and stroke of  $5\frac{1}{8}$  inches, that has a rating of 19.75 horsepower by the S. A. E. formula. The bore to stroke ratio of 1:1.464 insures a production well in excess of 25 horsepower.

The cylinders are cast en bloc with the water jacket integral from a special gray iron, with the intake manifold cast in the block. The water jacket is cast open, this insuring large passages that are thoroughly cleared and afford certain freedom of the circulation of water. The jackets are baffled, so that the water as it enters directly beneath the valves is circulated completely around each cylinder. The water jacket head is a specially designed plate that carries the large outlet manifold and it is secured by a series of bolts. Ac-



Side View of the Latest Service Truck, a Worm Driven Machine of 2000 Pounds Capacity Designed with Extreme Simplicity and Built of Well Known Standard Parts.

ponents produced by those who specialize the manufacture of high-grade vehicle units, which are recognized as standards throughout the industry, and which are designated to secure economic operation and long endurance in all operating conditions. These parts are in every instance highly developed, and very generally are perfected through long experience with service requirements as well as careful engineering.

The 2000-pound machine has been designed with extreme care to simplify the construction and to have all working parts as accessible as is practical with the fullest protection that has been sought. The attention given to lubrication has been unusually thorough, all moving contacting surfaces being insured adequate lubricity by oil cups, grease cups or internal sources of supply. The chassis is sold for \$1375.

### Unit Power Plant and Buda Engine.

The unit power plant consists of a Buda engine, clutch and transmission gearset, which is suspended at three points to insure against stresses from chassis dis-

cess to the water jacket can be quickly had for cleaning or inspection. The base flange is extended to carry the tappet guides and end and centre webs are provided to enclose the valve mechanism.

The crank case is a special aluminum alloy that is cast in two sections, the upper carrying the main bearings and the lower being divided by a horizontal transverse web, below which is the oil reservoir. In the transverse web are the oil pockets or troughs for the splash lubrication. The crank case sections are extended at the rear to form the bell housing for the fly-wheel. Special lugs on the case are designed to support the sod pan. The forward end of the assembly is supported by a trunnion seated in a bracket on the frame front cross member, and the rear is carried on arms cast integral with the upper half of the crank case. When installed in the chassis frame the lower half of the crank case can be removed for examination of or work on the main and connecting rod bearings.

The pistons are cast from the same material as the

cylinder block and after being turned are ground to size. They are channelled for four diagonally split eccentric expansion rings that are carefully machined and ground on the faces and sides to insure accurate fit. The pistons are provided with oil grooves and are drilled with relief holes to insure against the engine smoking. Much care is taken in boring and reaming the wristpin holes to obtain perfect alignment and accurate fit.

#### **The Crankshaft and Camshaft.**

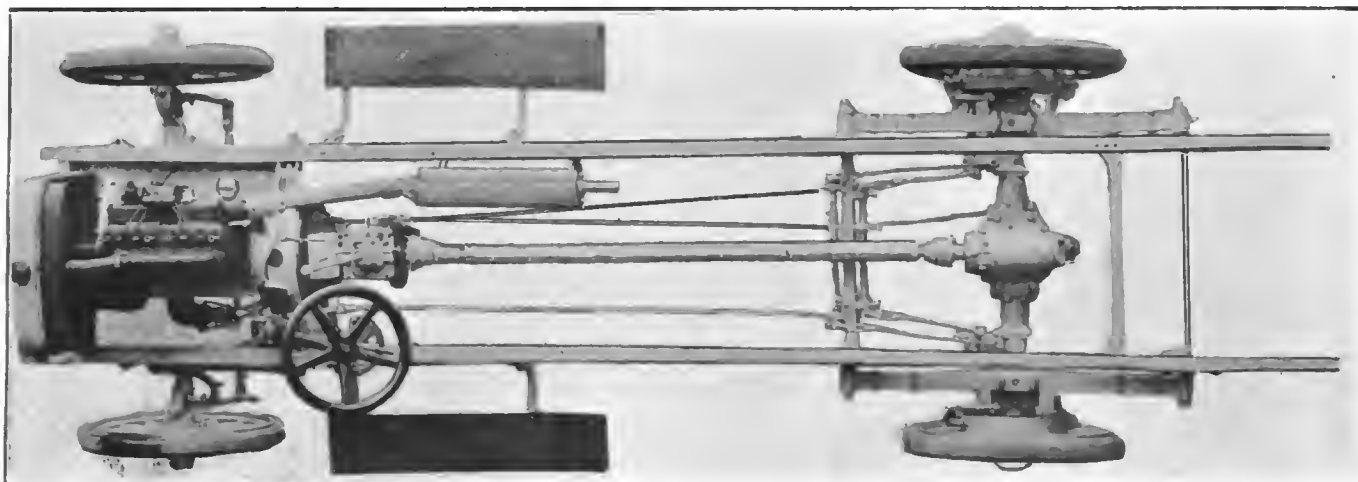
The crankshaft is an open hearth steel drop forging that is heat treated and machined and balanced on a special Norton crankshaft balancing machine. The flywheel flange is forged integral with the shaft. The shaft has a tensile strength of 120,000 pounds to the square inch and an elastic limit of 85,000 pounds to the square inch. It is a three-bearing type, the bearings being from front to rear,  $1\frac{3}{4}$ , two and  $2\frac{1}{4}$  inches diameter respectively, and in the same order  $2\frac{7}{8}$ ,  $2\frac{1}{4}$  and  $3\frac{1}{4}$  inches length, this giving a total bearing

special heat treated steel bolts. The small ends of the connecting rods are fitted with phosphor bronze bushings that are clamped in the rods, the bushings oscillating on the wristpins. The camshaft is mounted on large phosphor bronze bearings.

#### **Timing and Valve Mechanism.**

The timing gearset consists of a crankshaft, a camshaft and a generator shaft gear and these are made with wide faces and are helically cut to secure noiseless operation. The gears are enclosed in a case formed by an extension of the forward end of the crank case that is covered with an easily removable plate.

The valves are nickel steel heads electrically welded to soft steel stems, with the stem ends hardened to endure wear. The valve ports are  $1\frac{1}{2}$  inches diameter. The valves are interchangeable and are fitted with oil tempered springs. The guides for the valves are liberal in proportions and may be renewed when worn. The valve tappets are a mushroom type of spe-



**Top or Plan View of the Service 2000-Pound Worm Driven Truck, Showing the Unit Power Plant and the Main Element of the Transmission System.**

length of  $8\frac{3}{8}$  inches. The crankpin bearings are  $1\frac{3}{4}$  inches diameter and two inches length.

The camshaft is drop forged from a single piece of open hearth steel with the cams and the timing gear flange integral. The shaft is a three-bearing type with liberal bearings. It is machined and case hardened and the cams are ground on a special machine. The cams are exceptionally large and are designed for quietness and long endurance.

#### **Connecting Rods and Wristpins.**

The connecting rods are I sections, drop forged from open hearth steel that is heat treated, they are carefully machined and reamed to insure perfect centres and alignment, and they are balanced. The rods are not offset. The wristpins are large, are made from open hearth steel, are case hardened and are accurately ground and fitted. The wristpins are secured in the piston bosses by set screws that are locked. The main and the connecting rod bearings are nickel babbitt metal, the connecting rod bushings being mounted in the big ends with caps that are each secured by four

special alloy steel, hardened and ground to accurate fit, that operate in large guides secured in the base flange and they may be adjusted for wear by hardened screws and check nuts. The valves are enclosed by cover plates that may be quickly removed and which fully protect them against the accumulation of abrasives.

#### **Lubricating and Cooling Systems.**

The engine is lubricated by a combination force feed and splash system. The oil is carried in the reservoir in the base of the engine and it is drawn from a screen-filtered well by a gear driven pump and forced through tube to the main bearings and the timing gears, which are flooded. The excess lubricant drains to the base of the crank chamber, where it collects in the four transverse troughs into which the big ends of the connecting rods sweep. The overflow from the troughs is carried to the reservoir. The splash lubricates the crankpins, connecting rods, wristpins, cylinders, pistons, camshaft, cams and tappets. The oil pump and filter are removable from the crank case without removing other parts. The depth of oil in the

reservoir is shown at all times by an indicator that is placed near the combination breather and filler.

The engine is cooled by a thermo-syphon circulation of water through the jacket and the Long vertical tube radiator of large capacity with an extra size top tank. Radiation is insured by a fan mounted on annular ball bearings on an adjustable bracket on the forward end of the cylinder block that is driven by a flat belt from a pulley mounted on the generator shaft. The exhaust manifold is cast iron and is clamped to the cylinder block.

The fuel is carbureted by an automatic float feed carburetor that has a hot air connection and is controlled from the dash. The course of the ignition current is a Bosch high-tension magneto.

#### Power Transmission Systems.

The clutch is a dry plate construction with the alternate plates faced with Raybestos that is said to be very efficient and easy of engagement. The transmission gearset is a sliding gear selective type, having three forward speed ratios and reverse. The shafts and gears are of liberal size and are made of high-grade alloy steel. The shafts are mounted on Fafnir annular ball bearings.

The power transmission system consists of a tubular shaft  $2\frac{1}{2}$  inches diameter from the gearset to the rear axle, with a Spicer universal joint at either end, these joints being enclosed and fully protected. The rear axle of the machine may be, at the option of the purchaser, either a Timken-David Brown worm shaft and wheel full-floating type, or a Sheldon semi-floating construction with a worm shaft and wheel of David Brown design. The Timken rear axle is a standard type, with the housing in the three sections, with the end sections reinforced by nickel steel tube that form the sleeves on which the wheels are mounted. The central section encloses the differential assembly which, with the worm and the wheel, is assembled with the cover in a unit that may be removed or replaced without disassembling. The spring seats are formed integral with the axle housing. The axle throughout is fitted with Timken roller bearings.

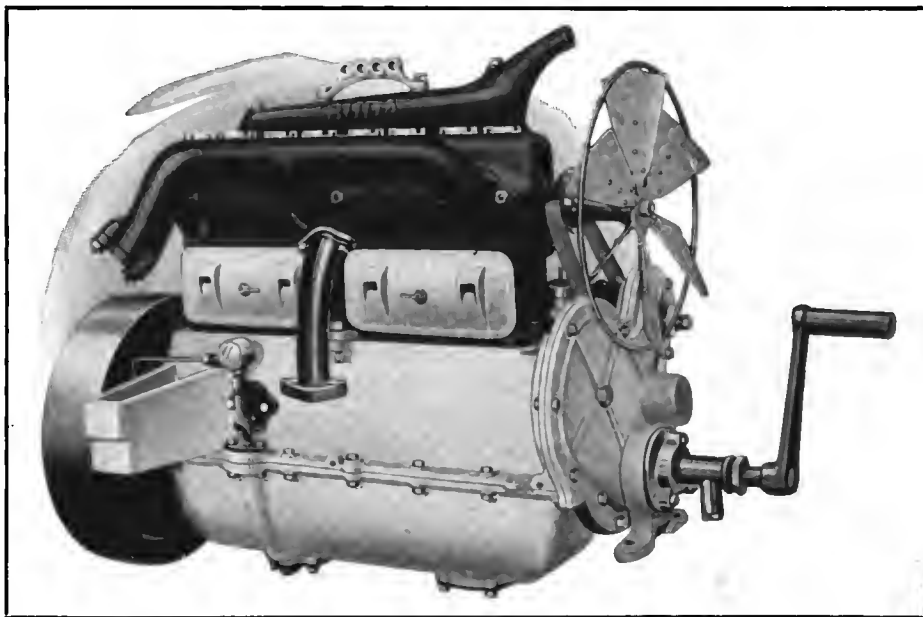
#### Choice of Rear Axle.

The Sheldon axle is constructed to a somewhat similar design so far as the housing itself is concerned, the end sections being reinforced with steel tube that form the sleeves for the axle shafts. The worm shaft, differential gearset and the axle shafts are mounted on high-grade annular ball bearings. The axle shafts are made from special alloy steel, of large size, that are heat treated and ground to accurate proportions. The spring seats are integral with the axle housing.

The front axles are either Timken or Sheldon, as

the purchaser may desire, these being with either make drop forged I sections that are heat treated and which are equipped with heavy steering knuckles and tapered roller bearings. The steering knuckle pivots, the tie rods and all the wearing parts are large and the pivots and the joints are bushed for renewal in the event of wear.

The frame is a pressed steel channel section of  $\frac{1}{4}$ -inch metal with width of  $4\frac{1}{2}$  inches and webs varying from  $1\frac{1}{4}$  to  $3\frac{1}{2}$  inches width, that is strongly gusseted and reinforced. This is suspended on semi-elliptic springs that are oil tempered, with silico-manganese main leaves, with all spring eyes bushed with phosphor bronze, and with the rear set banded. The forward springs are 40 inches length and  $2\frac{1}{4}$  inches width, and the rear springs are 50 inches length and  $2\frac{1}{2}$  inches width. The rear springs are mounted outside the frame, this reducing the height of the platform and greatly steadying the body when it is loaded.

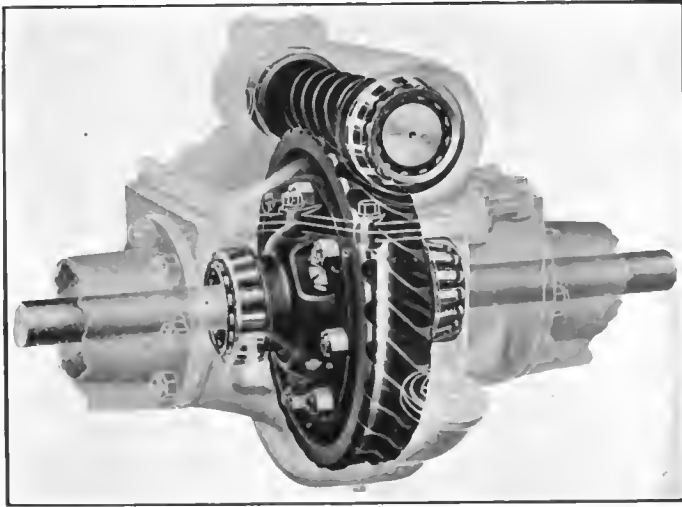


The Long Stroke Buda Engine That Is Incorporated in the Unit Power Plant.

The steering gear is a Ross irreversible worm and nut type, fitted with a double ball thrust bearing, which has unusually larger wearing surfaces. The gear is operated by an 18-inch hand wheel. The linkage is very large and strong. The two sets of brakes are both internal expanding within steel drums 16 inches diameter on the rear wheels. The service brake is operated by the usual foot pedal and the emergency brake by a hand lever. The ignition is controlled by a hand lever on the steering wheel, and the fuel supply by a hand lever on the wheel and by a foot accelerator. The gear shifting lever and the emergency brake levers are located in the centre of the footboard at the right of the driver, who is seated at the left side of the machine.

The wheels are a wood artillery type that have each 14 two-inch spokes, and these are shod with 34 by three-inch solid band tires forward and 34 by four-inch solid tires at the rear. The wheel hubs are unusually large to insure strength.

The chassis is equipped with a driver's seat, front fenders, running boards, two oil dash and an oil tail lamp, jack, tools and oil can, and is painted in lead.



**Phantom View of the Worm and Worm Gear and Differential Gearset of the Timken Rear Axle.**

The Service 1½-ton, two-ton, 3½-ton and five-ton trucks generally follow a standard design. These are equipped with Buda engines, those of the first two machines having cylinder bore of 4⅞ inches and stroke of 5½ inches, and S. A. E. rating of 27.25 horsepower; the engines of the 3½-ton and five-ton machines have cylinder bore of 4¼ inches and stroke of 5½ inches, these being rated at 28.9 horsepower by the S. A. E. formula. These are claimed by the maker to develop 40 and 45 horsepower respectively at maximum speed. The engines are cooled by circulations of water forced through large radiators mounted on springs by centrifugal pumps of generous capacities. The sources of ignition current supply are Eisemann high-tension magnetos. The engines are mounted on sub-frames.

The clutches are leather faced cone types and these are coupled to transmission gearsets of selective sliding gear construction by shafts having Hartford universal joints at either end. The gearsets are Brown-Lipe design, those of the 1½ and two-ton chassis having three forward speed ratios and those of the 3½ and five-ton chassis having four forward speed ratios and reverse, the gears being of chrome vanadium steel, on nickel steel shafts that are carried on Timken roller bearings. From the gearsets to the rear axles the drive is by shafts having each two Spicer universal joints to Timken-David Brown worm shaft and gear rear axles. The axles are standard constructions and are designed for hard service. The front axles are Timken made.

The frames are heavily made and are reinforced and strongly gusseted, with sturdy cross members. These are suspended on semi-elliptic springs that are triple heat

treated. All spring eyes are bushed with bronze and all spring bolts are hardened and ground with grease cups integral. The brakes of the 1½-ton and the two-ton chassis are the same type, the service set contracting externally on the rear wheel drums, and the emergency set expanding internally on the same drums. The brakes of the 3½-ton truck are a duplex internal expanding type that operate within drums on the rear wheels.

These chassis are all driven from the left side and the hand control levers are located in the centres of the footboards. The wheels are wood, artillery type, and are fitted with 36-inch solid band tires, those of the 1½-ton truck being 3½ inches forward and five inches rear; those of the two-ton truck being four inches forward and either four-inch dual or seven inches single rear, and those of the 3½-ton truck being five-inch single forward and five-inch dual rear.

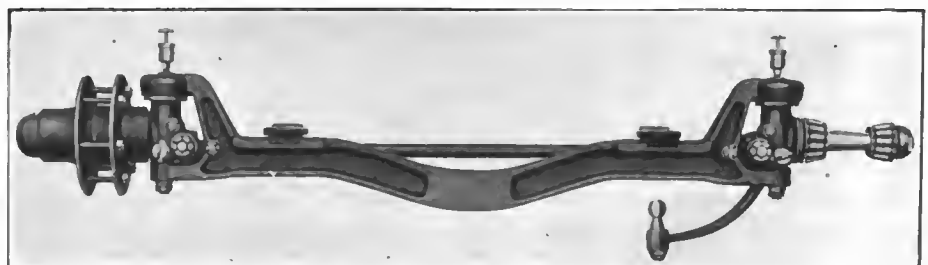
The wheelbase of the ton truck is 135 inches, of the 1½-ton truck 140 inches, of the two-ton truck 160 inches, of the 3½-ton truck 171 or 198 inches, and the tread of these chassis are 56, 58, 59 and 62¼ inches in the order named. The loading space in these chassis are respectively 108 inches, 120 inches, 132 inches and from 144 to 192 inches. All chassis are sold with the equipment specified for the newest type machine.

#### **BOSTON MAIL SERVICE PROTESTS.**

The contract for hauling mail by motor truck in Boston, made by the government with a private contractor who has been using electric trucks that were poorly equipped with chains and other necessities, and were therefore unable to deliver satisfactory service under severe conditions, has aroused strong protests against the new method of doing the work.

Owing to the great congestion of freight on the New Haven and other railroads, mail service generally in southern New England has been more or less disorganized, and this condition has been used strongly in an attack on the Boston distribution system by those who would have preferred to see the Boston Elevated Company keep its contract to haul the mail by trolley car.

It is understood that the department has insisted that the present equipment of electric trucks be re-



**Timken Front Axle That Is a Standard Component of the Service 2000-Pound Truck.**

placed by more powerful vehicles of the gasoline type, and the contractor has been notified to bring the machines up to an adequate operating efficiency.

**MOTOR STREET SWEEPER A BIG ECONOMY.**

A saving of 72 per cent. as compared with horse costs has been made by the city of Boise, Idaho, which has been using an Elgin motor sweeper to clean its 12 miles of paved streets. In the first six months of 1915 the sweeper worked 1616 hours, swept 32,264,812 square yards, used 1335 gallons of gasoline, 310 quarts of oil, collected 1802 cubic yards of sweepings and used up 35 hickory fiber brooms.

The cost was 12 cents per 1000 square yards swept. It is a remarkable record in view of the fact that the cost of this work in most cities the country over is 33 cents. The sweeper is worked 16 hours a day and its average work per hour is 20,000 square yards.

The sweeper travels from four to six miles per hour. At the forward end of the chassis is a dust box, which will hold  $2\frac{3}{4}$  cubic yards of refuse. A high pressure water tank, which holds enough water for three or four miles of sweeping, is mounted in front. The water is forced on the street in a fine spray just in front of the broom to keep down dust.

The sweeper is a three-wheeled rig, with two drive wheels in front and a single steering wheel in the rear immediately under the power plant. Sweeping, sprinkling and dirt collection are performed in one operation.

**MILITARY TRUCK TEST MADE.**

To test motor trucks for military purposes a run was recently made by four trucks from Los Angeles to San Diego, Cal. Battery A with all its equipment was carried on the trucks. The total distance covered was 268 miles. Each truck carried a full gun crew and trailed a caisson and a gun. The battery supply wagons were loaded on the fourth truck, making a load of four tons.

A scout truck left the main battery on the outskirts of the city and made the 134-mile run to San Diego in four hours and 22 minutes. Lieutenant-Colonel Graham of the regular army acted as official observer and was greatly surprised at the efficiency of the trucks as transports.

**TRAFFIC COURT FOR NEW YORK.**

Mayor Mitchell has suggested the establishment of a traffic court in New York. The idea would be to assign all traffic cases, or as many of them as could be brought to one place for trial, to a single magistrate. The mayor thinks the present traffic difficulties would be greatly lessened if all cases were tried by one man who would come to know traffic conditions thoroughly.

G. M. Montgomery, formerly travelling representative of the Bessemer Motor Truck Company, Grove City, Penn., has been appointed eastern travelling representative for the Standard Motor Truck Company of Detroit, Mich.

**URGE BENZOL AS MOTOR FUEL****Expert Chemists Believe It Can Be Used as Economically as Gasoline.**

The rapidly rising price of gasoline, accompanied by the statement of the producers that it is brought about by an acute shortage in the supply of crude oil, is bringing into prominence against discussion of the possibilities of using benzol or alcohol fuels in motor cars.

In a paper read recently before the Chemists' club, I. F. Stone, president of the National Analine and Chemical Company, said of benzol that with the present production, which has been enormously increased since the war began, the price has been reduced to the point where it can probably compete successfully with gasoline.

Careful experiments with the fuel in motor cars and motor trucks—it is very largely used in Europe—have shown that a gallon of it has about 25 per cent. greater power content than gasoline. It would have 25 per cent. advantage at the same price and could successfully compete if the price were 25 per cent. higher.

But it is quite likely that with all the coke oven and steel companies in America preparing to produce it as a by-product of their business, it could now be made for the same price as gasoline. The annual production at the present time amounts to 15,000,000 gallons, as compared to 3,000,000 gallons before the war, and the production can probably be still further increased.

**HYATT EMPLOYEES STUDY METALS.**

Employees in the physical testing laboratories of the Hyatt Roller Bearing Company have organized a course in the metallography of iron and steel. The course consists of correspondence lessons given by Professor Sanveur of Harvard and is supplemented by letters and practical examples taken from the regular shop work. There are two lessons a week. Tuition is charged for the course, but any employee remaining two years with the company will have his tuition refunded. The Hyatt company permits the use of its metallographic apparatus for instruction purposes.

**QUAD DEMONSTRATIONS IN SNOW.**

The New York representatives of the Thomas B. Jeffery Company devoted the entire time of a Jeffery "Quad" during the heavy snows in December to pulling trucks of various kinds out of the drifts where they had stalled. This service was free to all truck owners and the efficiency of the Quad in the snow, which affected it very little because of it being driven by four wheels, resulted in the sale of a number of these trucks.

## MINE PRODUCTS INCREASE.

### National Statistics Show 1915 Yield to Be Greatest in History.

Notwithstanding the fact that the price of steel, iron, zinc, copper and other metals is reaching unprecedented levels, the report of the United States geological survey shows that the mines have produced in many cases in 1915 more than in any previous year and in all cases excepting only anthracite coal more than had been produced than for many years.

In the western states metal production of all kinds showed an increase of \$130,000,000 over the production of 1914 and for the country as a whole this increase is \$250,000,000. Full returns will probably show that in the mining industry 1915 was the country's most productive year.

Copper broke all records, the year's production being \$83,000,000 greater than that for 1914; iron shipments amounted to 55,000,000 gross tons, which is a gain of 38 per cent. over the preceding year, or an increase in value of \$27,645,000. Zinc production was the greatest in history, exceeding the previous year by 82,000 tons, valued at \$85,100,000. The value of the lead produced was only 2500 tons greater, but the value of the output due to higher prices showed an increase of \$8,500,000. The increase in gold production indicated by the returns so far in is about \$7,000,000.

Coal has not shown much change. The increase in coal is between four and five million short tons, or about one per cent. The quantity of bituminous increased about 6,500,000 tons, while anthracite decreased about 2,000,000 tons. A very slight increase in the yield of petroleum for the year is indicated. The greatest increases in the mining industry were in the western metal mines.

## PORTER WITH FORM-A-TRUCK.

The Smith Form-a-Truck Company has announced that Samuel D. Porter, formerly with the Maxwell, Columbia and Stoddard Dayton companies, has been appointed general sales manager and will make his headquarters at the Chicago plant. The company has purchased material for 40,000 attachments whereby Ford chassis can be transformed into one-ton trucks and expects to dispose of 50,000 of them during the year. Contracts for delivery during the first few months call for 10,000, it is said.

## NEW KOEHLER AGENCIES.

The H. J. Koehler S. G. Company has made agency arrangements with Covell's Garage, Canisteo, N. Y.; William S. Bowlby, Clinton, N. J.; Reo Springfield Company, Springfield, Mass., and Walter C. Gilbert, Derby, Conn.

## TRUCK ECONOMY IN POSTAL SERVICE.

In a hearing at Washington recently Second Assistant Postmaster-General Praeger declared before the House committee on postoffices, that the substitution of trucks for horse drawn screen wagons had resulted in great financial and time saving advantages.

The statement was based on the working of the trucks in Chicago, Philadelphia, Washington, St. Louis and Detroit. The hearing was given following a contention by an Illinois congressman that the trucks could make only 1.6 miles an hour in the congested districts of Chicago and were not as efficient as horse wagons.

Mr. Praeger said to the contrary that the trucks, even in the loop district, were able to make 5.7 miles per hour. The service is soon to be extended to Indianapolis and other cities of that class.

Much of the opposition to the truck service arises from the fact that in most cases the trucks are government owned, whereas the services which they displaced were on contract, either with owners of teams or with street railway companies. The trucks are also being used to replace pneumatic tube service, which was installed about 15 years ago in many cities, and as this renders a considerable investment in the tube services obsolete, this is another cause for opposition to the use of machines.

## CHAMBER SAFETY FIRST COMMITTEE.

A Safety First committee, with J. Walter Drake, president of the Hupp Motor Corporation, as its head, has been appointed by the National Automobile Chamber of Commerce. The committee will work to safeguard the workers in the various factories from dangerous machinery and practises and will co-operate with the safety first organization in reducing the number of highway accidents.

Talks on methods of avoiding street accidents will be given in the schools, and special articles on the subject will be published. Manufacturers will lend moral support to all just prosecutions against careless motorists. A campaign of education against reckless use of motor vehicles will be carried on by members of the chamber among their customers who purchase cars and trucks.

## FIRESTONE APPOINTS MANAGERS.

Dan C. Swander, formerly branch manager for the Firestone Tire and Rubber Company in New York City, has been made district manager in charge of the eastern branches of the company and is succeeded in New York by C. D. Studebaker, who becomes branch manager. E. W. Be Saw, formerly branch manager in Des Moines, Ia., will have charge of the western branches. G. A. Spohr, formerly a salesman, will have charge of the Des Moines branch.



## LABOR SAVING BODIES FOR MOTOR TRUCKS.

### The Economies of Time of Vehicles and Men Obtained by Study of Operating Conditions and Developing Special Equipment Suited for the Work.

**C**ONSTRUCTION of motor truck bodies intended for general work seemingly does not demand ingenuity or special training, for what can be regarded as standard types that is—platform or express—are supplied by a majority of the builders of the machines, and a buyer is justified in assuming that such equipment is designed to meet the chassis requirements, or, in other words, "to fit."

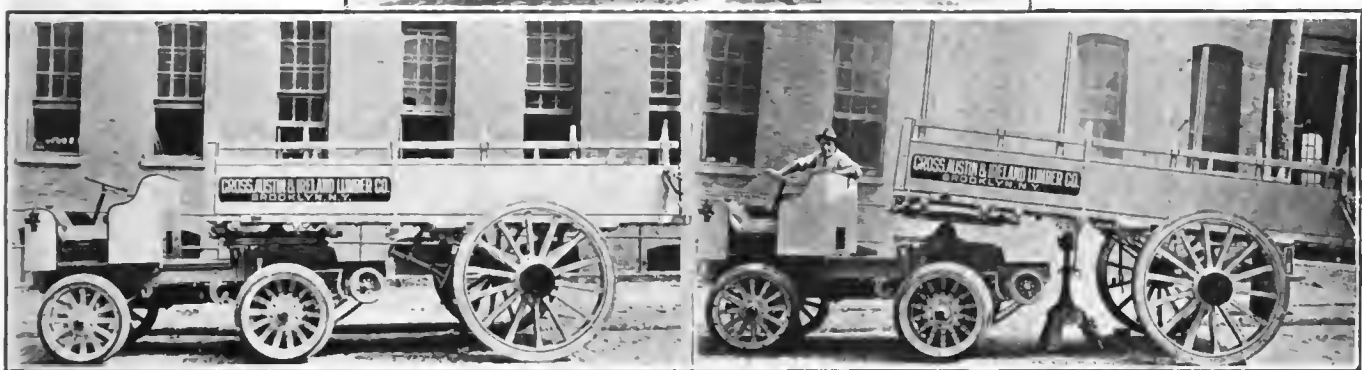
Some of the truck manufacturers prefer to sell the chassis only, because body building can only be done profitably with adequate facilities and tools and expert workers, or what may be termed a complete wood working shop, operated in connection with the factory, and as work of this character is, as a rule, done apart from the supervision of the buyer, it cannot be modified or changed save at the cost of at least delay and the expense for materials and labor.

So far as the shop is concerned, special production

satisfactorily a thoroughly equipped shop must be maintained and this placed in charge of a man who has capacity to design and construct as well as organize and direct. Another experience is that truck building is an entirely different industry from body making, and unless the two are carried on as entirely different departments there will naturally be confusion, if not conflict, of interests.

#### The Real Value of the Spiral Body.

But if the truck builder wishes to divorce himself from all other business purposes than producing machines, he must sell the chassis and leave to the purchaser the problem of obtaining bodies that will serve the requirements. This is the general policy of all European manufacturers of trucks, but American buyers appear to believe that because what is known as a stock body is cheaper they are saving money by using them, rather than obtaining the better results from



Gasoline Lumber Tractor and Special Trailer Body for Short Stock: At Left, the Equipment Complete; at Right, the Body Jacked for Uncoupling; Above, the Trailer Body in the Yard in Readiness for Loading.

is expensive because the prices obtained cannot sufficiently exceed those charged for stock bodies to insure a reasonable profit. Not only this, the purchaser of a chassis believes that he ought to receive discounts if he orders body equipment, and cannot understand that such concessions are actually price cutting.

From one viewpoint a truck manufacturer ought to produce both body and chassis cheaper than if these were purchased separately, and this is accepted by those who have not experience, but those who have endeavored to supply bodies have found that to do this

what is built purposely for their uses.

There is one large American concern that has always built the bodies used on its trucks and wagons, and it has many times refused to sell machines unless the buyer purchased equipment turned out of its own shops. Though this policy has been more or less criticised, largely by those who were not permitted to install bodies they proposed to build, there has not been an instance of the machines affording the service that was not satisfactory, nor of not enduring for the period stated.



In stating the reasons for this policy the company emphasizes that when it builds a vehicle it promises that it will do a stated work and that it will be practical to operate it in the service for which it is to be used. But operating economy and vehicle endurance are to a considerable degree dependent upon the weight of the load and the manner in which it is carried. The loading, if the body is built for the work, is then a matter that is directly under the supervision of the owner, who can accept the responsibility if the machine is overloaded or the freight is not distributed equally.

The machines will be sent out, however, with bodies that will be built both to fit the chassis and the requirements of the owners, and this is as far as any concern can safeguard both itself and the users of the trucks it builds.

#### Truck Builders Not Body Specialists.

There is one factor that is usually lost sight of by the truck buyers, and that is that the builders of machines have not as a rule the experience in designing and constructing special equipment that is the big asset of the special body makers. Without exception the concerns that were successful in producing specialized horse vehicles turned to motor truck body development, largely because their services were sought by purchasers of machines who previously dealt with them, and who realized that practical knowledge in horse vehicle building could be equally well applied to power trucks.

Cost is regarded differently by men, some of whom place one price against the other without much regard for quality, while others consider what they obtain for the difference in cost—that is, measuring the assumed greater value by the cost. This is a method of judging that can be well applied to vehicle bodies, and while there is undoubtedly a difference in initial cost, the economy of operating expense, which is undeniably the principal result, with the probability of greater endurance, when carried through the life of the machine much more than offsets the added price.

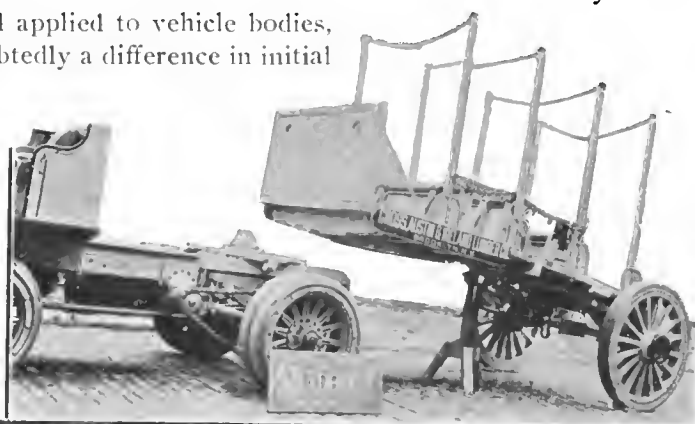
Those who are engaged in business that requires heavy freightage are becoming more and more impressed with the advantages of using the motor truck or the tractor in much the same manner as animals are now used—that is, to use the machines for haulage and carrying a part of the load, and utilizing the power to a far greater degree than is possible or practical with the single truck. Power is necessary to obtain speed, but as the speed is reduced the power can be in like ratio used for hauling. By this is meant that a truck ought to have at least double the capacity when used with a semi-trailer, and the tractor ought to have power to haul from three to four times the load that would be carried on a truck having the same engine rating. But speed must be lost sight of and size of freight considered.

Speaking literally, a tractor is a machine that is used for drawing, but not for carrying loads, and there is no word that precisely defines the truck or tractor, so-called, that partly carries and hauls a load. Considering the truck that is used with what is known as a semi-trailer, this has a longer wheelbase than what is known purely as a tractor, and it may be so equipped that the coupling for the semi-trailer may be removed, a body installed, and used for carrying freights. The advantage of this form of equipment is apparent.

#### Tractor Can Only Be Used as Such.

The tractor, however, can only be used with trailers or a semi-trailer, and it cannot be converted to other uses, but it will probably have greater capacity for haulage than the other. Each then has its own particular advantages, and one will note that special body equipment for semi-trailers or trailers is necessary to obtain the greatest haulage value, just as special bodies are necessary for trucks.

Some special form of tractors driven by gasoline engines have been developed to haul heavy loads and these are all used with the semi-trailer type of bodies. These are specially interesting from the viewpoint of those who have heavy haulage to do and who desire to obtain the greatest capac-



Semi-Trailer Body for Hauling Long Timber: At Left, the Gasoline Tractor and the Body Coupled to It; at Right, the Body Loaded with Very Long Timber: Above, the Body Elevated on a Jack Ready for Coupling.

ity from a single unit. One of the claims made by those who have operated tractors or trucks and semi-trailers is the saving that can be made in wages, as well as operating expense.

Assuming that a five-ton truck can be operated for \$12 a day, including \$3 a day depreciation charge. A semi-trailer that will haul 10 tons can be used with the truck for practically the same cost, and the work will be increased probably 75 per cent. as compared with a single truck, the lessened mileage due to the heavier loads being the reason why the work is not doubled. The truck, however, cannot be handled quite as advantageously as the shorter tractor, which will probably show a slight gain as compared with the truck.

#### Tractors for Hauling Large Loads.

The custom of those who have freightage of this kind is to use the tractor type of construction with the large loads, principally because these machines are designed purposely for this work and are usually heavier and stronger in construction and are better adapted as a whole than are the trucks. Tractors are built with the view of the rear axle carrying practically all of the payload, but trucks, with few exceptions, carry some of the weight of the freight on the forward axle. The short wheel-base is decidedly advantageous where the space for working is limited, and it is not at any time a disadvantage.

Several types of semi-trailers have been designed by the Shadbolt Manufacturing Company, Brooklyn, N. Y., for use with tractors by the Cross, Austin & Ireland Lumber Company of that city, for hauling lumber. The lumber company desired to obtain large capacity vehicles and preferred to carry the loads so far as possible on steel tires. Trailers were desirable from the fact that they could be loaded at the yard while the tractor was making deliveries. As the loading is necessarily done by hand, holding a truck or a tractor during the loading period would mean the loss of valuable time.

#### Converted Horse Equipment Not Practical.

Converting horse equipment was not believed practicable because of the very heavy stresses of the loads when hauled through the streets, and that as fast speed as was possible was desired. The one of these bodies, which is illustrated, was for transporting very long timber or lumber, and the other, which is also shown, was for carrying short stock that could be piled higher. Obviously the freights would be large. Handling these in the yard would take time, because lumber must be stacked by men, and the bodies must be quickly unloaded or left at the delivery points to be hauled back to the yard when the loads had been removed by

the crew or by those to whom they were delivered.

Hauling heavy loads at comparatively fast speed meant that the loads must be carried on springs to protect the trailers, and the construction must be strong and enduring. To economize time in coupling and uncoupling the bodies the trailers must be built and equipped so they could be raised or lowered quickly. The trailer bodies must be mounted on good sized wheels to minimize the power required for hauling, and the mounting must be heavy enough to endure the strain of the relatively high centre of gravity of the loads when stacked to the capacity of the bodies.

#### Semi-Trailer for Lumber Freightage.

The semi-trailer designed for the loads of long timber necessarily had greater length than the other. The shorter body was built with a rectangular steel axle on which were mounted a pair of large wheels, and on the axle was installed a set of long, heavy, semi-elliptic springs. The platform was built with a frame having a stout deck, which was fitted with flat bolsters at the rear for the spring end guides, and deeper bol-



Tractor and End-Discharging Semi-Trailer Body Designed for a Brooklyn, N. Y., Contractor, Equipped with Manual Hoist.

sters at the forward end to carry the upper section of the Shadbolt fifth wheel, which was used for coupling to the tractor. The frame was built with numerous cross members and longitudinal sills and stringers, and fitted with the usual heavy steel brackets, bands and reinforcing braces. The deck was crowned slightly between the ends to afford greater strength.

The forward end of the trailer body carried what might be termed the dash, this being a heavy construction of wood, on the top of which was mounted a wooden roller, braced from the back with steel rods, and back of this were three similar risers or mounts, the first and third of equal height and the second the higher. At the rear end of the frame was mounted another roller, this being slightly above the deck and fitted with a ratchet controlled by an upright hand lever so that the roller could be turned forward freely, but not turned backward unless the ratchet were released. The heights of the rollers were so graduated that they would all support a timber placed on them.

At either side of the platform a series of stakes were mounted in well braced steel sockets, the purpose of these being to give support to the load and prevent it moving sidewise. This was an adaptation of lumber wagon construction.

#### Carried Heavy Jack and Base.

To raise and lower the forward end of the trailer body a large screw jack was provided, the base of this being mounted on what might be likened to a three-legged stool, built of heavy timber, this affording a solid support on uneven surfaces. This was arranged to be carried on the body suspended by chains, so that it could be dropped or slung quickly. With a bar lever the body and load could be lifted or lowered with comparatively little labor. The body was coupled to the tractor with the Shadbolt fifth wheel, this having transverse and longitudinal shafts and spring buffers to absorb the starting and braking stresses.

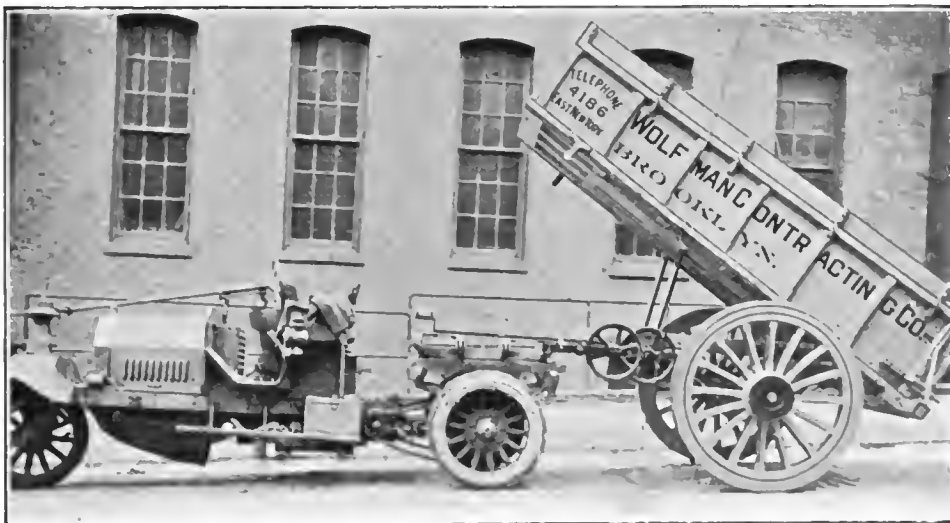
The other body, very similar in general construction, was designed for carrying very long timber, but two instead of the three mounts for the rollers were

had been lifted from the tractor by the jack.

These bodies are in constant use and have given entire satisfaction from the viewpoint of quick haulage, for they can be unloaded practically by gravity, the construction is not costly when its service value is considered, and the different bodies can be used with a single tractor. The time required for loading is not a factor governing the utility of the machine. Long and short hauls can be made as conditions require, and the trailers may be left at delivery points for unloading without loss of time. The company used two types of tractors, the one with the jackshaft forward of the rear axle and the other with the jackshaft mounted at the extreme rear end of the chassis, back of the wheels, the driving chains being forward of the jackshaft. This construction gives a very short wheelbase, which is desirable in working the machine where the space in the yard and at the places of delivery are small.

#### End Discharging Trailer Body.

A type of end discharging, manually hoisted body was also built by the Shadbolt company for the Wolfman Contracting Company of Brooklyn, which is used with a Martin tractor. This body is carried on a heavy frame, that is supported on semi-elliptic springs mounted on dead rear axle equipped with large steel tired wheels. The forward end of the body and the rear of the chassis frame are equipped with the Shadbolt fifth wheel. The frame of the body rests nearly its entire length on the main frame, there being two long hinges at the rear. Vertical guides at the forward end of the body that drop below the level of the frame prevent any



The End-Discharging Semi-Trailer Body Elevated, Showing the Adaptation of the Manually Operated Hoist.

placed between the front and the rear of the platform, and in loading the timber was carried forward over the front roller, this elevating the load well above the head of the driver, so that the tractor could be turned without interference.

#### Adopted for Quick Load Discharging.

With either type the load was discharged by simply releasing the binding chains and the hand lever at the rear, the lumber sliding until the rear end rested on the ground, and then by starting the tractor the body was drawn ahead and the forward end of the load dropped. When loading at the yard horses were placed under the bodies to afford better support than would be obtained by the jacks alone. With the longest type of body a jack was used only at the yard, and two struts or legs, adjustable in vertical guides, which could be secured by hook-ended rods engaging with pins in the struts, were fitted. These struts were used instead of a horse and could be easily raised or lowered and adjusted for length to support the body when it

transverse movement.

The hoist consists of two struts that are pivoted to the body frame, there being chains from the lower ends of the struts to a shaft installed transversely on the main frame. This shaft is turned by a train of gears operated by a crank moved by hand, and is retained by a ratchet. The body can be elevated to any desired height, in comparatively quick time and with little labor. When the body is lowered the struts hang vertically ahead of the wheels, and because they are free to swing on their pivots they cannot be damaged by contacting with road obstructions. This equipment is extremely practical and the cost is low when the utility of the body is considered.

The Atterbury Motor Car Company, Buffalo, N. Y., is said to have received an order for 500 trucks from a large English corporation which does a large trucking business in British cities and between various towns in England.

## HUFF URGES FURTHER S. A. E. STANDARDIZATION.

**R**USSELL HUFF, the newly elected president of the S. A. E., in his address to the members at the annual meeting in New York City, praised very highly the work the organization has done in the past and suggested some new undertakings which it could profitably engage in during the present year.

He said that while the standards committee had accomplished some wonderful results in its work during the past few years, it has only scratched the surface, as there are great fields of endeavor which are as yet untouched by standardization. He said that the work had saved the industry millions of dollars and was held in very high esteem by those who control its destinies.

The new president expressed the hope that the influence of the society, which was already impressing itself on the government and the army, as shown by official recognition of its importance, could be extended; and one method of such extension which he suggested was the formation of more student branches, while he thought that there is perhaps room for additional professional sections.

There are several lines of engineering closely related to automobiles which he suggested the society take up. One of these, he said, was the designing of motors which are used in motor boats. The society, he said, also needed a comprehensive library and good engineering digest. These, he said, were suggestions of opportunities to extend the growth and influence of the society of which no advantage had yet been taken.

He expressed great appreciation of the honor of becoming the president of the society.

### Higher Quality of Members.

William H. Vandervoort, the retiring president, in his address laid particular stress upon the necessity for choosing men of high standing and ability for the important committees and offices of the society and of scrutinizing the qualifications of applicants for membership so that the character of the society would be such as to attract the most desired members.

The membership of the society, he said, had fallen off somewhat during the past year. This was due largely to the fact that several months of the severest depression were included in the year and many were forced to resign membership because of financial considerations, while many others who would be desirable members were prevented from joining for the same reason.

The quality of the society's membership was better than it had ever been, as the list of members had been systematically cleaned of dead material. Many of the accessory and vehicle builders are not as well informed as they should be regarding the work of the society, he declared. A special effort is necessary to secure their co-operation with the work and to obtain their appreciation.

He said it should be the constant effort of every

member to arouse a keener appreciation in influential quarters of the work the society is doing and of the value to each company of the membership of its engineers in the society. The same appreciation should be aroused among those who would make desirable members of the body.

He said that the increasing activity of the sections and the greater interest shown in the work by those who had only moderately appreciated it in the past, indicated a greater success and a larger influence for the society in the future.

The detail work that has fallen on the chairman of the committee on standards would soon make it necessary to supply a staff to take care of it he said.

He spoke of the formation during the year of the midwest section of the society at Chicago and of the reorganization of the Pennsylvania section, which gives the society in all six active sections.

He urged that the standards work of the society be extended to foreign countries in an effort to establish international standards. The present time Mr. Vandervoort thought to be as auspicious as any for the pressing of that work. The standardization results of the society have been laid before the United States bureau of standards and promises of co-operation have been received from that body.

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## GEORGIA'S NEW REGISTRATION LAW.

A new law passed by the Georgia legislature relating to motor vehicles requires a new series of license fees for different types and sizes. The amounts required are: Motorcycles, \$2; cars to 25 horsepower, \$3; 25 to 40 horsepower, \$4; exceeding 40 horsepower, \$5; for electric vehicles, \$4; for trucks to one ton, \$3; trucks from one to three tons, \$4; trucks from three to five tons, \$5; more than five tons, \$6.

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## CHANGES IN F. W. D. ORGANIZATION.

J. C. Turk, who was formerly with the Four Wheel Drive Company, Clintonville, Wis., has severed his connection with the concern. F. A. Cole, who has represented the company in Chicago and the middle western territory, will hereafter make his headquarters in New York City.

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## PAPER ON GASOLINE DANGERS.

"Hazards in Handling Gasoline" is the title of a paper issued by the Department of the Interior, a limited number of which are available for free distribution. The paper gives the results of a study made by G. A. Burrell.

## **BUS LINE WANTS CITY SUBSIDY.**

### **Private Enterprise and Municipal Trolley Service Clash in Australia.**

In Adelaide, Australia, where the city operates the trolley lines and a private company is operating a 'bus service between the city and some of its more populous suburbs, there is strong competition between the two.

The 'bus company claims that the streets and roads over which it operates are in such condition that it is almost impossible to use motor vehicles satisfactorily. The roads are full of holes and there are open drains at street crossings at frequent intervals, all of which greatly increases the maintenance cost on the cars.

The company demands a 16-foot wide roadway of concrete on the streets on which it operates, similar to those that have been built in many parts of the United States during the past few years.

Inasmuch as the company is affording an important service, which the city does not give because the population served is not sufficient to pay for the construction of a trolley system, it asks also a subsidy from the city amounting to a dollar of subsidy for every dollar of capital invested in the enterprise.

The city government is not favorable to any of these contentions and manifests no disposition to make the business of operating 'buses for private gain especially profitable or easy. The public, apparently, is not considered by the municipal authorities.

## **FARMERS USE 4000 TRUCKS.**

The Kissel Motor Car Company, Hartford, Wis., has information that 4000 farmers are now operating motor trucks. This is four per cent. of all the trucks used in the United States. These machines have nearly all been bought within the last two or three years, which indicates that the farmers are very generally realizing the economy of machines for haulage. A canvas of farm owners by the company showed that all were pleased with the service afforded by their trucks and many believed that they were making large savings by operating them.

## **RHODE ISLAND HAS 17,000 CARS.**

The report of the State Board of Public Roads shows that there were in Rhode Island Jan. 1, 1916, 17,000 motor vehicles, for which 23,000 persons held drivers licenses. This is one car to every 35 of the population. A year ago the number of cars in the state was 13,058, showing an increase in 12 months of 3942 motor vehicles.

The White Company, Cleveland, O., has adopted the Eisemann magneto as standard for all its trucks and deliveries on the new contract were begun in January.

## **PRICE MAINTENANCE SCHEME VALID.**

Makers of motor trucks who are interested in maintaining the prices of their machines will be glad to know that the United States Court of Appeals has held that the plan of the Victor Talking Machine Company for maintaining its prices is valid.

Each Victor machine bears a plate stating that it is not sold, but that it is rented under certain patents for a royalty and becomes the property of the holders when the patents expire. It is also provided that for violation of the license the machines may be taken back by the company for the royalty minus five per cent. for each year of use. By this provision the company is given full control of the machine until the expiration of the patents. The present suit arose over a controversy with R. H. Macy & Co. of New York City over price maintenance. The Victor company undertook to reclaim machines that were in its possession.

## **EXPRESS CARS FOR MOTOR VEHICLES.**

In the present congestion of railroad freight service, especially in the East, express shipments of motor cars and trucks are constantly becoming more common. There is also a large demand for such shipping by private owners of cars, which has reached such proportions that the Wells-Fargo Express Company has found it worth while to design and build special express cars for automobiles. The cars are so built that the entire ends are folding doors that can be opened and inclined platforms are set up on which the vehicles can be pushed into the cars. The lower express rates now the vogue on all sorts of goods apply as well to motor cars.

## **WHITE HOLDS ITS OWN TRUCK SHOW.**

During the week of Jan. 17 the White company's Philadelphia branch held a truck show in its own building at which only White trucks were exhibited. This has been the custom of the branch for several years and has previously been very successful. The show rooms were handsomely decorated. The trucks displayed have been purchased by Philadelphia firms, but have not yet been delivered or been in service on the streets.

The Detroit Auto Parts Products Company has been formed with \$50,000 capital stock by Joseph, Eugene and Leo Siegel of the American Lady Corset Company of Detroit. The company will handle car parts and accessories.

The Moreland Distillate Truck Company of Los Angeles, Cal., which assembles trucks from parts bought in the middle west, has raised prices five per cent. on all sizes of Moreland machines.



## MOTORIZING FIRE DEPARTMENT EQUIPMENT.

**New York City Rapidly Converting Its Apparatus or Replacing That Drawn by Horses---  
109 Mack Chassis Now in Service, and More than 200 Sold to Municipalities.**

**M**OTORIZATION of the fire departments of the cities, towns and villages of the United States is progressing with great rapidity—far greater than is realized by even those who have reason to be informed of municipal affairs, and because of three factors that have been so well established by hundreds of instances of practical service for varying periods that there can be no question of the results obtainable with motor apparatus.

There are those who may believe that power driven fire equipment has not been sufficiently proven to justify the confidence that obtains with the use of that drawn by animals. Those having such belief, however, undoubtedly base opinion upon observation or experience with those who drive pleasure cars, who as a rule have but little practical mechanical knowledge and who are very frequently ignorant of or indifferent

every use. First of all the safety of the firemen demands this care, and of equal importance is the fact that the protection of property cannot be given unless the machines are in normally operative condition.

There is no question that any type of fire apparatus is driven fast for short distances as a rule and in the event of need is worked without regard to anything else than obtaining the fullest capacity so long as it can be operated. The average period of service is comparatively short, but whenever needed the machines ought to be in condition to operate for hours, or even days, to maximum. This last statement, however, applies more particularly to fire pumps, of which more will be stated.

### Three Factors Impel Motorization.

The three factors to which reference has been made are economy of operation, economy of investment and



A Typical New York City Fire Company, Equipped with Two Combination Hose and Chemical Wagons and a Gasoline Tractor Drawn Steam Fire Pump.

to the probable consequences of neglect or abuse.

One can grant that power fire apparatus would deteriorate if not cared for, that it might be used without lubrication by careless firemen, that tires may be damaged through accident or differing mishaps that might be peculiar to the service, no matter how well designed or constructed, and yet with hardly an exception these possibilities are well safeguarded even in what may be regarded as the poorest organizations, and could not happen in the splendidly organized and disciplined departments of the cities.

Eliminating this aspect impels the statement that practically every fire department chief regards the efficiency of his apparatus as his first care, and with knowledge that this can only be obtained through careful and systematic attention and upkeep, the equipment is thoroughly examined and adjusted following

increased efficiency, and while any one of them would be sufficient to justify consideration of power apparatus in the place of animal drawn equipment, there is every reason to believe that all three may be realized by the municipality that has vested the administration of its fire department in men who are willing to study conditions, both with reference to the present and the future needs, and provide the equipment that is best adapted to the requirements.

Fire protection is constantly becoming a more and more serious problem. The construction of buildings of inflammable material, their use for purposes that are favorable for combustion that may originate from innumerable sources, the storage of property that will burn rapidly, indifference, lack of caution and many other contributing causes increase the danger from fire with the growth of population. This condition may be

said to be general, but the probabilities for fires and for resultant destruction are greater in the larger cities.

#### High Efficiency the Price of Safety.

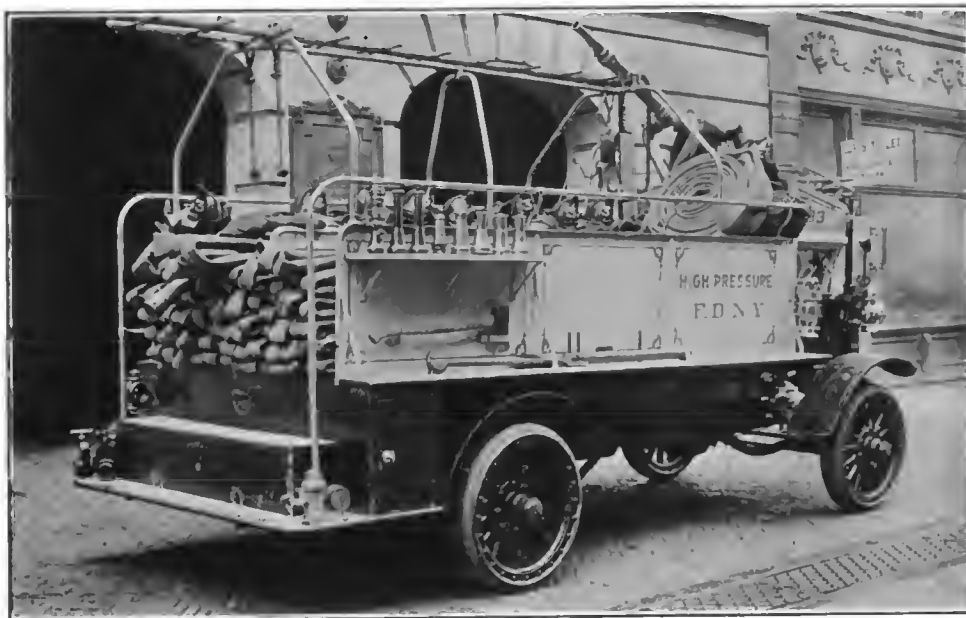
This statement is based on experience, and realization by the fire department officials and the boards that have administration over the departments in municipalities of large proportions of the possible consequences of fire has impelled policies of preparing for any exigency that may arise, both in the way of apparatus and men. Generally speaking the larger the city the better organized and the better disciplined is the fire fighting corps, and usually there is a disposition at least to adopt what will in any way increase the efficiency of the department.

Theory may be an admirable foundation from which to make development, but there would be extreme difficulty convincing a fire chief that a new apparatus would prove as efficient as it was claimed, because his measure would be what had been tried by

the actual activities of the departments, no matter what politicians may desire, and who are responsible for the safety of lives and property, seldom advocate the use of an apparatus or the adoption of a policy unless they are satisfied with it from practical knowledge, and this means service experience extending over a sufficient period of time to establish thorough confidence.

New York City probably has the finest fire department in the world. The city is extremely large and it has every condition that might be conjectured, from the scattered suburban residences to the largest business structures in existence in point of height; the narrow and traffic congested streets that prevent rapid movement of fire apparatus; buildings that are practically one construction in hundreds of blocks; manufacturing structures that are producing inflammable material, stores that are stocked with what is quickly combustible; thousands of old buildings that are dangerous from the viewpoint of uses made of them and the materials of which they are built.

There are hundreds of structures so lofty that fire must be fought from adjacent buildings or on the floors in them, and where streams of water can only serve when pumped by the largest engines or by the high pressure system, supplemented by standpipes and tanks. While New York City has not suffered conflagrations such as have devastated Boston, Baltimore, Chicago and other cities of smaller size, this has been due chiefly to efficiency of the equipment of the department and the experience and capability of the men directing its use.



One of the 56 High Pressure Hose Wagons on Mack Chassis in Operation in New York City—These Machines Are Equipped with Turret Nozzles.

service and found practical. Only results can establish that will justify investment. Not only this, he is more familiar with the conditions with which he has to deal than others, and he ought to be qualified to pass judgment upon what he knows will afford results.

#### Economy of Appropriations.

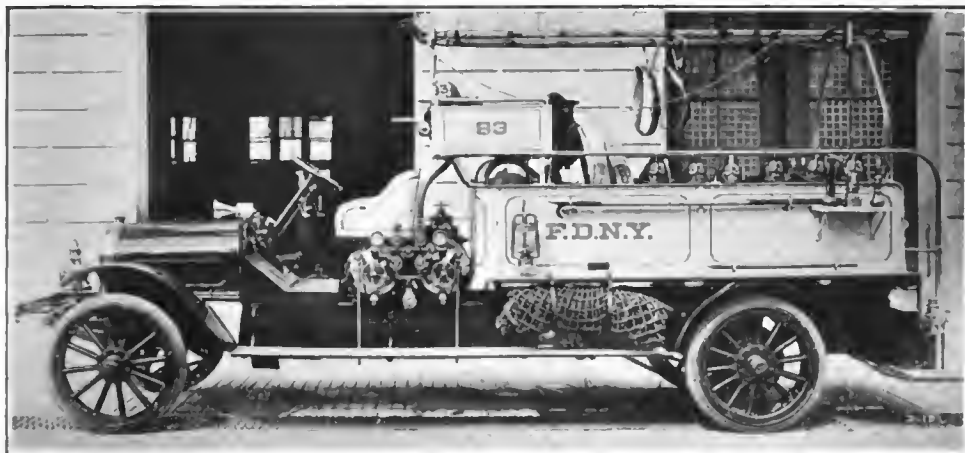
From the view point of the administrative board the highest efficiency is necessary, but this must be limited by the money available for the maintenance of the department, and as economy is supposed to be the first law of political preservation or permanency, the results naturally depend upon the appropriation for the year. Some municipalities that are well governed have carefully defined policies for development, and these are followed so far as possible, but no plan is determined unless it has been found practical and justified by the expenditure.

Practical fire fighters, the men who have to direct

For this reason the judgment of the men who are doing more than fire fighting, who are studying and devising means of fire prevention and who are compelled by force of circumstances to adapt themselves and their apparatus to efficiently protecting life and property in conditions that are extreme, is to be regarded as having unusual weight. Other cities in the United States have made greater progress than New York, if one is to judge from the fact that the fire departments are completely motorized, among them being Lynn, Mass.; Springfield, Mass., and municipalities of approximately the same size, but none of these has had to meet the same problems or deal with conditions that anywhere approach those in the metropolis.

#### Motorizing the New York City Department.

The conversion of the New York fire department will require from 18 months to two years more if the



A Standard Type of Combination Hose and Chemical Wagon in the New York Fire Department, Used Outside of the High Pressure System District.

same progress already made is continued, and while this will mean the expenditure of a very large amount of money, the aggregate will by no means reach what would have been required had all new apparatus been purchased. As a matter of fact the motor driven equipment includes a very large number of steam fire pumps that have been converted by the use of motor driven tractors. This has been a great economy, for it means the continuation of the service of pumping engines of large capacity, of types especially adapted for use in New York City, which were in highly efficient condition, and which, had they been replaced by gasoline pumps, would have been sold for a comparatively small part of their actual value to the city. These pumps have all been tried in every way and their capacities are known, and the experience has been that steam pumps are not only extremely reliable and can be depended upon for long and hand service, but they can be used for thawing hydrants in cold weather, which is a very important work, although necessary but a short part of the year.

In the conversion of the steam fire pumps the cost

since been installed in the department. The department has also given long trial to gasoline-electric tractors for hauling water towers and aerial ladders, and these have been found very satisfactory. One battery driven tractor has been used with a steam fire pump for several years with unusual success, the apparatus being equal to all demands of the service without mishap of any kind and is extremely economical of operating expense.

The greatest change has been made in the adoption of gasoline engine driven aerial ladder trucks, high pressure hose wagons and combination hose and chemical wagons, which have replaced apparatus drawn by animals, mostly two and three-horse teams. The aerial ladder trucks are sometimes known as city service trucks, and these are equipped with the usual form of mechanically elevated extension ladder and a number of smaller ladders, the longer of which is usually 30 feet. In addition, the trucks carry scaling ladders, hooks, pikes, crow bars, axes and the tools that are ordinarily needed, together with other standard equipment.



City Service Truck, Carrying a Mechanically Raised Aerial Ladder and Usual Series of Manually Elevated Ladders and Tools.



The ladders are, as a rule, mounted on chassis which correspond to the standard types of three-ton trucks, with long frames and extra wheelbases, which conform in other respects to standard specifications. The combination hose and chemical wagons are generally regular equipment, mounted on a truck chassis of two tons capacity, with such modifications as are desirable to meet the requirements of the service. These wagons carry two chemical tanks and about 250 feet of small hose. They are located in the residential sections of the city, one or two being installed in a station with a steam fire pump. They are fast, are expected to make long runs and to have the combined utility of a regular hose wagon and a chemical apparatus, and for this service they have been found very satisfactory.

The high pressure hose wagons, so-called, are a type that may be regarded as designed for New York City service, where there is a high pressure water system that is located in the sections where there are

ful construction, so after the installation of the first few the change was made to the three-ton chassis, which afford excellent satisfaction. There is reason to believe that this type of wagon will be used wherever the high pressure service mains are located. These are not equipped with chemical tanks or small hose, but in other respects they are the same as the combination wagons, although they have increased capacity for standard size hose.

In addition to these the department equipment includes trucks that are used for the transportation and construction work of the fire alarm telegraph bureau, trucks for the haulage of supplies from the storehouses and repair shops to the various stations, as well as trucks for the instruction of novice drivers and firemen who are undergoing the usual period of training incidental to joining the permanent organization.

#### Conversion Done at City's Shops.

The motorization of the fire department apparatus is being done carefully and systematically, the machines being installed and horse apparatuses being withdrawn, the conversion being made at the department shops under the direction of the superintendent of the shops. These shops are in themselves extremely interesting to the visitor because they were originally established for the repair and maintenance of the equipment, and spare apparatus is kept there that is used for replacement of whatever is withdrawn. As the department must always be kept up to its standard with reference to apparatuses, the work at the shops is carried on systematically, so that overhauling is done throughout the year, and emergency repairing is made as conditions demand.

In New York City the policy is always to have the heaviest apparatus in the sections of the city where the needs are the greatest and for this reason the steam fire pumps are only used where the height of the buildings demand them, or where hydrant pressure is not sufficient to insure adequate streams of water from the hydrants without pumping. When horses were used the fire stations were established closely together, to insure having sufficient apparatus within call of any alarm box to meet any ordinary requirement, and in the event of additional alarms equipment was summoned from other stations, both within and without the district.

#### Greater Efficiency from Speed.

With motor apparatus the response to alarms is made so quickly that much valuable time is often gained, that is, if the discovery of fire is made directly after origin. This mobility in the business and manu-



**Two-Ton Worm Driven Mack Chassis Equipped as a Combination Hose and Chemical Apparatus—Two of These Machines Are in Service at Bridgeport, Conn.**

large office and manufacturing buildings. These wagons have what are known as turret nozzles mounted at the forward end of the body or ahead of it, these nozzles being so constructed that they may be revolved and elevated or depressed to guide a stream of water in any direction. There is a two-way coupling or water gate, located at either side at the height of the chassis frame to which two lines of hose from a steam pump or high service hydrants may be attached, and the wagon may be stationed wherever it may be used to the best advantage. One man can direct a stream of water that could not be held by several men, this affording the advantage of a large high pressure line, while the men are released for other duties.

#### Built for Heavy Service.

These wagons are intended for very heavy work and they are generally mounted on three-ton truck chassis, although a few are on four-ton truck chassis. These latter were found too heavy to have the speed that is required and there was no need of such power-

facturing sections means a decided gain in efficiency, because seconds at the start are often more valuable than minutes after a fire has gained headway. In the residential sections, however, the speed of the apparatus means that there need not be as many fire companies with motor apparatus as with horse equipment, for the machines can cover much larger areas with far greater efficiency. As the city is expanding rapidly there is not only better protection with the motor installations, but this can be given with fewer men, so that for this character of service there is a decided saving in municipal investment for stations and equipment, and the operating expense is materially lessened throughout from the fact that this is in ratio to the mileage driven and to the care given.

As might be assumed, great care is taken to have the apparatus highly efficient. Cleanliness is one of the best of preservatives for machinery, for this not only prevents deterioration from neglect, and it leads to the attention that means much more—the constant adjustments that will obviate wear. The life of motor apparatus in service in New York City is not known, but considering the care that is given and the systematic inspection and repair, a score of years would not be an unreasonable estimate. In fact, use for that length of time might be consistently expected if the equipment will endure as well as that drawn by animals.

#### **Leaning Toward Equipment Standardization.**

While statement cannot be made that the department has standardized on one make of apparatus, there is seemingly a leaning in that direction from the fact that the department, which will probably have as many motor apparatuses as it now has of both types, has purchased no less than 109 Mack chassis, some of which it used for conversion of horse equipment and some for new. The city now has in its service 56 three-ton chassis equipped as high pressure hose wagons, 33 two-ton chassis equipped as combination hose and chemical wagons, 12 three-ton chassis equipped as ladder trucks, three four-ton chassis equipped as high pressure hose wagons, two two-ton chassis equipped as supply trucks, two 3000-pound chassis used by the fire alarm telegraph bureau, and one two-ton chassis equipped as an instruction truck.

#### **Mack Fire Apparatus in Other Cities.**

The International Motor Company has delivered, including those in the New York department, more than 200 different apparatuses. Philadelphia has bought 16 of these, which includes two two-ton chassis insurance patrol wagons and a two-ton high pressure wagon, and 13 three-ton chassis, of which one is equipped as an insurance patrol wagon, three as double chemical and hose wagons, one as a high pressure hose wagon, seven as combination hose and chemical wagons, and one as an emergency repair wagon.

Baltimore has purchased three two-ton and eight three-ton chassis of the former type, one being a service wagon and two high pressure hose wagons, and of the latter type two are high pressure hose wagons and

six are combination hose and chemical wagons. Allentown, Penn., has bought two 3000-pound chassis chemical wagons, a two-ton chassis, a three-ton tractor for a ladder truck and a three-ton combination hose and chemical wagon.

Richmond, Va., has installed six two-ton combination hose and chemical wagons; Wilkesbarre, Penn., has purchased five combination hose and chemical wagons on three-ton chassis and a Mack chief's car, and Rochester, N. Y., has added five two-ton combination hose and chemical wagons to its department. There are three Mack hose and chemical wagons in service at Wilmington, Del., and two of these wagons and a ladder truck at Binghamton, N. Y.

Two Mack apparatuses have been bought by Chicopee Falls, Mass.; Plainfield, N. J.; Taunton, Mass.; Freeport, L. I.; Chester, Penn.; Bridgeport, Conn.; Paterson, N. J., and Muscatine, Ia., while there is one Mack apparatus at Asbury Park, N. J.; Huntington Manor, L. I.; Morristown, N. J.; Cynwyd, Penn.; Boston, Mass.; Dobbs Ferry, N. Y.; Anniston, Ala.; Media, Penn.; Beaver, Penn.; Garrettsford, Penn.; Rye, N. Y.; Piermont, N. Y.; Great Neck, L. I.; Brandywine, Penn.; Bay Shore, L. I.; Mount Holly, N. J.; Annapolis, Md.; Roselle Park, N. J., and Johnstown, N. Y.

There is unusual interest obtaining in the two two-ton chassis sold to the Bridgeport, Conn., fire department from the fact that these are worm driven machines, all of the other apparatus that has been referred to being chain driven. This type of chassis is known as the "AB" and they are equipped as combination hose and chemical wagons. The service obtained with these machines thus far has been extremely satisfactory. So far as is known they are the only worm driven fire apparatus in use, the chiefs of the other departments being satisfied with the chain driven chassis, with which they were familiar and, in many instances, experienced.

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#### **ROLLIN H. WHITE TO MAKE TRACTORS.**

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Rollin H. White, formerly vice president of the White Company, who has not been active in the management of that concern for some time, has bought a 38-acre tract in Cleveland, upon which a new plant for the manufacture of farm tractors will be erected. The new works will cost \$200,000. This is only one portion of the plant that it is expected eventually to utilize. The Nickel Plate railroad runs through the property, affording excellent shipping facilities.

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The B. F. Goodrich Company has bought a large five-story building, known as the Terminal Warehouse, in Kansas City, Mo., and will store there that part of its output which is intended for distribution throughout the southwest. The business will amount to \$2,000,000 a year. The sales will be in charge of F. A. Oberhue.

**MOTORIZING CITY DEPARTMENTS.****Boston Adopting Trucks for Municipal Service with Systematic Plans.**

The departments of the city of Boston are rapidly adopting trucks in place of horse wagons. In three years the park department, which is a large user of horses, will have completely motorized its service. The approval of the city council has been asked for a plan to sell the horses and equipment which the department now has in order to buy additional trucks. A third of the trucks needed can be bought in this way and for the rest yearly appropriations will be depended upon.

There are already 10 machines in use by the park department. Employees are permitted by law to work only eight hours a day and with horses a large part of this time is consumed in stable work and care of the horses so that vehicles are doing productive work only about four hours a day.

When the trucks are secured drivers will be transferred to regular laborers' jobs. There are now 108 machines in the service of the city. The public works department has 33. The fire department now has 30 motor trucks and its entire equipment is being motorized as rapidly as possible. The police department has increased its equipment of automobiles to eight and the school department now operates six machines.

**ELECTRIC TRUCKS IN ENGLAND.**

The shortage of good truck drivers for commercial purposes in England, and the employment of large numbers of women for such work has greatly encouraged the use of electric trucks by British business men because of the greater simplicity and ease of operation of these vehicles. Before the war there were practically no electric trucks in Great Britain, gasoline and steam being almost exclusively used.

But the commandeering of large numbers of the trucks in service, together with the driver difficulty, has turned many business men to the electric machines, and quite a number are now in use. There were 150 electric trucks in England a year ago and now there are 660, according to a recent report.

Messrs. Harrods, Ltd., a large department store in London, has recently received a shipment of 18 ½-ton electric delivery wagons, making a total of 73 electrics operated by the company. Other large installations are being made and the increase of electric freight vehicles in England is expected to be rapid.

**DENBY EDUCATIONAL AWARDS.**

Prizes offered by the Denby Motor Truck Company, Detroit, Mich., for the best work on the first three months' lessons of its correspondence course in salesmanship and truck operation, have been awarded. The first prize went to A. W. Boulden of Seattle, Wash., who owns a transfer business. The second prize went to R. S. Hillman, a roofer and

furnace man, employed by R. G. Young of New Gallilee, Penn.

Many of the business men who have assigned one of their employees to take the course have organized a class and give the benefit of the instruction to their whole organization. The course has been approved by many merchants and enrollments are coming in rapidly.

**EXPORT FIGURES ARE TOO LOW.**

While the reports of exports from the United States made by the Department of Commerce have shown very large numbers of motor cars and motor trucks, the Chamber of Commerce of the United States has discovered that these statistics are by no means accurate and the exports are probably far larger than they appear in these reports.

Export statistics are collected under a regulation passed in 1821, which is insufficient to secure the correct reporting to the department of the various shipments that leave the country. So incomplete are the figures that they are almost valueless, and experts, while they know that the percentage of error is very large, cannot estimate intelligently how large it is.

The chamber is bringing these facts to the attention of the government and all the business men of the United States with a view to securing a change in the law which will make possible the collection of accurate figures by the department, and put the business men of the country in a position to know just how great the American export trade has become.

**M. & A. M. RE-ELECTS OFFICERS.**

Directors and officers of the Motor and Accessory Manufacturers, Inc., whose terms expired the first of the year, were re-elected at the meeting of the association held in New York during the automobile show. F. Hallett Lovell, Jr., of the Lovell-McConnell Manufacturing Company, Newark, N. J., is president; C. W. Stiger of the Stromberg Motor Devices Company of Chicago, Ill., is vice president; C. E. Thompson of the Steel Products Company, Cleveland, O., is second vice president; T. J. Wetzel of the Dyneto Electric Company, New York, is third vice president; L. M. Wainwright of the Diamond Chain and Manufacturing Company, Indianapolis, Ind., is treasurer, and Alfred P. Sloan, Jr., of the Hyatt Roller Bearing Company, Newark, N. J., is secretary and assistant treasurer.

Hale & Kilburn of Philadelphia and the Vulcanized Products Company of Muskegon, Mich., were elected to membership. The directors re-elected were F. Hallett Lovell, Jr., C. E. Thompson, Alfred P. Sloan, Jr., and C. E. Whitney. William M. Sweet continues as manager.

**DECEMBER SHIPMENTS LARGE.**

Reports made by the traffic department of the National Automobile Chamber of Commerce to the board of directors at its meeting in New York during the automobile exhibition, showed that 15,582 car-

loads of automobiles were shipped during December. This was an increase of 140 per cent. over the 6378 carloads shipped during the same month a year ago.

For the entire year 200,000 carloads were shipped as compared to 140,000 during 1914. The great shipments in connection with the glut of export freight are bringing about a car shortage and representatives of the traffic department are to visit various distributing centres to do what they can toward securing early release of cars by dealers.

At present there are in service 59,274 freight cars designed for carrying automobiles in service. The New York Central lines have 9000 new automobile cars on order and the Pennsylvania railroad 1000.

**ELECTRIC STORY BY PICTURES.**

A booklet on electric vehicles for delivery service issued by the New York Edison Company is entitled "Some Pictures and a Few Words." It sets forth pictorially the advantages of the electric automobile over the horse drawn vehicle. Much material has been prepared with statistics on this subject, but the whole story is told simply and practically in this book without the use of a line of type except the captions. The idea on which the book is based is economy in operating cost, in care and in room occupied when the machines are not in use, in space occupied at the curb or loading platform and dependability under difficult operating conditions. The book was prepared in collaboration by the automobile and advertising bureaus of the company.

**ERIE RAILROAD FERRY RATES.**

The Erie railroad some time ago published a new tariff on vehicles using its ferries between New York City and Jersey City, which would have increased the rates from 56 per cent. to 169 per cent. Numerous protests were made to the Interstate Commerce Commission with the result that it ordered the enforcement of the tariff suspended until a thorough investigation could be made.

It then found the rates unjustified and continued their suspension. The railroad contended that the commission had no jurisdiction as the traffic was purely local, but the commission, acting under a decision of the United States Supreme Court, assumed jurisdiction.

**WILL SHOW TRUCKS AT TRENTON.**

The first automobile show ever organized in Trenton, N. J., will take place at the state armory in that city under the auspices of the Chamber of Commerce and the management of John L. Brock, March 15-18 inclusive, at which both trucks and pleasure cars will be shown. The armory is about the size of Madison Square Garden, New York City, and there is sufficient space for an exhibition of large proportions. Any profit from the show will be divided among the exhibitors.

**REVERSE FIRE SPEED VERDICT.**

A decision by the Minnesota supreme court reversed a verdict in a lower court and ordered a retrial of a case where the jury mulsted for damages Assistant Chief Fred E. Granzow of the Duluth fire department because his automobile killed a four-year-old girl while he was responding to a fire alarm.

The right of fire apparatus to disregard speed limits in responding to an alarm was admitted by both sides, but it was assumed that this did not apply because the fire in question was outside the city limits of Duluth and the department responded not because of legal duty, but through humanitarian motives.

The supreme court held that as the car was on its way to a fire inside or outside of the city it did not have to observe the speed limits. In September in a wreck of the same car Chief Granzow was killed. An Illinois court recently held that fire apparatus under any circumstances was obliged to observe the same speed regulations as private motor cars.

**OPPOSE DURANT'S G. M. C. MERGER.**

Eight of the 14 present directors of the General Motors Company have announced themselves as opposed to any plan to transfer the control and management of the company from those who hold it at present, and have invited stockholders to form a stock voting trust to begin at the expiration of the terms of the present directors and continue for three years. This would prevent for that length of time any effort of W. C. Durant to combine the General Motors Company with the Chevrolet Motor Car Company.

Stock ownership will, of course, decide the struggle, since the success of the voting trust would depend on its ownership of a majority of the stock, or whether interests sympathetic with Durant or the banking management, which has been in control for some years, have the majority of the stock.

The directors who have signed the letter to stockholders are Samuel F. Pryor, vice president of the Remington Arms and Ammunition Company; Albert H. Wiggin, president of the Chase National bank; Thomas Neal, Charles H. Sablin, president of the Guarantee Trust Company; James A. Storrow, of Lee, Higginson & Co.; C. S. Mott, Albert Strauss, of J. and W. Seligman & Co., and Emory W. Clark of Detroit.

The circular is accompanied by a blank asking the stockholder's signature to the arrangement. Five members of the present board are proposed as members of the voting trust.

**GRAMM-BERNSTEIN CATALOGUE.**

A finely designed and handsomely printed catalogue of motor trucks it manufactures has been issued by the Gramm-Bernstein Company of Lima, O. It shows Gramm trucks used in many services and illustrates and explains clearly the features of construction of the trucks, which in many details are original. A feature of the book is a photographic representation of a letter from the English

representatives of the company telling of the excellent results secured by 400 chassis that have been sold for commercial purposes in England. This correspondent had on hand, so the letter states, orders for 150 trucks that had not been delivered, and with money in the bank in New York for payment was asking for 500 or more additional chassis to be delivered as rapidly as they could be built.

**PRACTICAL SHOP ECONOMY.**

**Labor Saving Devices Greatly Increase Efficiency in Factory Production.**

Production efficiency is obtained in well organized shops and factories by the use of specialized tools and skilled workers, but economies can be developed and obtained by special fittings and equipment that would be serviceable for no other purpose. This is demonstrated in the accompanying illustration of a department of the Russel Motor Axle Company's plant at North Detroit, Mich., which shows a line of one-ton internal gear

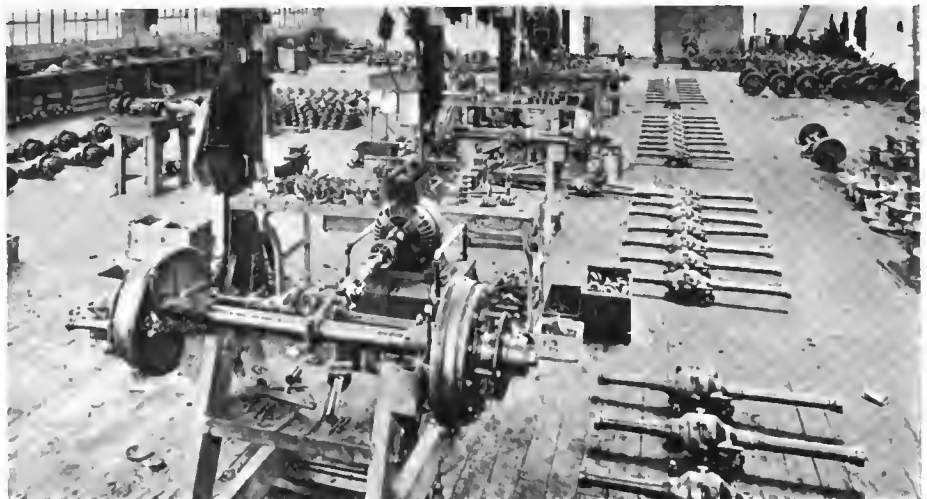
rent from pulleys the portable testing machine can be operated anywhere in the building. This obviates the need of removing the axles from the assembling stands until the bevels and internal gears have been properly adjusted and each has been tested for quiet running.

**MODERN MOTOR TRUCKS.**

A well illustrated catalogue of Modern Trucks, made by the Bowling Green Motor Truck Company, Bowling Green, O., has been issued. Modern trucks in many lines of service are shown pictorially and there is a description of the various parts used in the construction of these machines, which is also well illustrated.

**ROCK TRUCK ON STEEP HILL.**

For hauling stone from the Eagle Rock quarry, located midway up the famous Eagle Rock hill in West Orange, N. J., a six-ton Garford truck with an automatic dump body is being used. The grade is 12 per cent. on this road and in some places it increases to twice that. Last



Portable Testing Stands in the Assembling Department of the Russel Motor Axle Company, North Detroit, Mich.

drive axles before the final inspection that would pass them to the assembling room.

The axles are placed on stoutly built racks that can be moved easily from place to place in the assembling department. Each rack has a bench beneath it on which the assembler keeps his tools. After the bevel gears of the jackshaft differentials have been tested on a machine and finally adjusted, the jackshafts are removed to the racks seen in the illustration, where the brake mechanism and the pinions and internal gears are assembled and the axle beams are bolted to the housings to complete the assemblies.

Portable testing machines, such as are shown in the illustration, are moved to the assembly stands and each axle is driven by an electric motor that will turn it from 350 to 375 revolutions a minute. This test is supervised by the chief inspector, who must be satisfied of the quietness of the axle before he passes it to the shipping department. By suspending the cable carrying the electric cur-

rent from pulleys the portable testing machine can be operated anywhere in the building. This obviates the need of removing the axles from the assembling stands until the bevels and internal gears have been properly adjusted and each has been tested for quiet running.

**DAVIS HORIZONTAL MOTORS.**

Davis horizontal opposed motors, which are operated with gas, gasoline or kerosene, are described in a new booklet which has just been issued by the Davis Manufacturing Company of Milwaukee, Wis. The motors are all of the four-cycle type. The motors are about half the weight of the single-cylinder type of engine, and about 10 times the weight of the high speed automobile motor of the same horsepower. They are portable or stationary and may be used for marine purposes or for farms, foundries, shops, mills, garages, electric light or pumping plants.

## KOEHLER ONE-TON INTERNAL GEAR DRIVEN TRUCK.

**C**ONCENTRATION on the production of a single chassis type is the manufacturing plan of the H. J. Koehler S. G. Company, Newark, N. J., the design having been developed to meet the requirements of those who desire an extremely dependable machine. The company has built freight trucks for a number of years, standardizing a single type that had a load capacity of 2000 pounds. The original Koehler machine was equipped with a two-cylinder opposed engine, and the power was applied through a planetary transmission gearset incorporated with the jackshaft, the rear wheel being driven by side chains.

The Koehler truck now being produced is 2000 pounds capacity, but it has a four-cylinder engine, clutch and transmission gearset in a unit, and the internal gear rear axle is driven by a shaft, this affording a construction that is fully enclosed and thorough-

quality by the public are used largely in the construction. Exceptional flexibility is shown by the truck in operation and speeds are obtainable from two miles an hour on high gear and up to 30 miles per hour on level roads under good running conditions. The motor has the power to take the truck with its full load over most hills on high gear.

A unit type power plant combining motor, clutch and transmission gearset is employed. It is supported at three points in the approved method for avoiding the stresses resulting from the weaving of the frame.

### Four-Cylinder Power Plant.

A long stroke, four-cylinder, four-cycle, water cooled motor with both exhaust and inlet valves overhead is used. The cylinder bore is  $3\frac{1}{2}$  inches and the stroke is five inches. With the efficient overhead valves this motor will develop 30 horsepower.

The cylinders are cast en bloc and the upper portion of the crank case is integral with them. The jacketed cylinder head contains the entire valve movement for all four cylinders and is detachable. A quick outlet for the burned gasses is provided to a manifold which is separate from the cylinder head. This keeps the valves and adjacent parts cooler than with other types and insures the greater efficiency of the cooling system.

Lubrication of the motor is accomplished by a forced feed system in which the oil is cir-

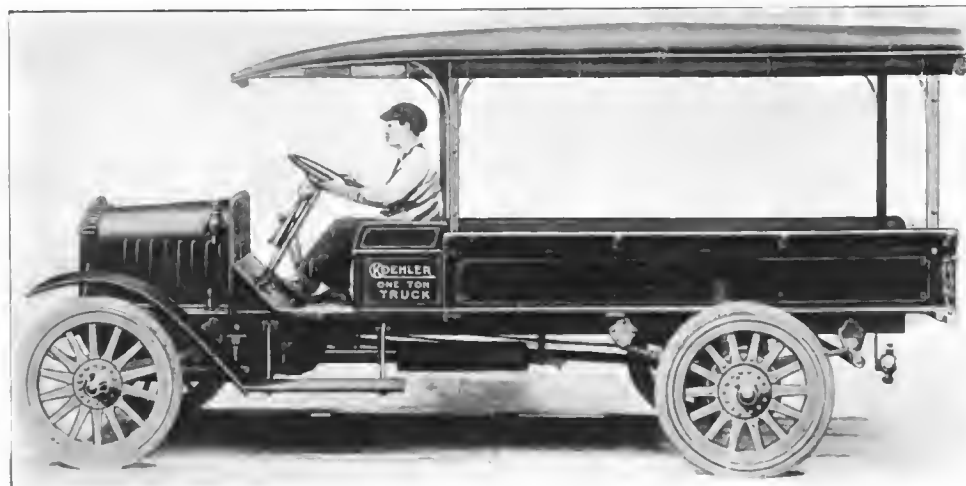
culated by a positive gear pump from the crank case reservoir. It is forced upward to all the working parts and from these it drains back to the reservoir after it has been strained. The system is positive and no adjustments are necessary.

The valves are large and interchangeable. The connecting rods are long and are drop forged I sections. The camshaft is made in a single piece, is drop forged, hardened and ground. The crankshaft is supported by three main bearings that are two inches diameter. The crankshaft and connecting rod bearings are of the bronze shell type faced with nickel babbitt. These bearings are readily accessible.

### Other Engine Details.

The radiator is a built up type, having separate top and bottom tanks, and the side members are bolted together around a vertical tube core or cooling system. The tank at the top is deeply ribbed, so that it adds material to the radiation area, which is 9500 square inches in the radiator core itself.

Behind the radiator is an 18-inch diameter fan driven by a flat belt, which further promotes cooling



The Koehler One-Ton Internal Gear Driven Chassis Equipped with a Flareboard Express Body and Standing Top.

ly protected. The machine is designed to serve the needs of those who desire comparatively fast delivery of moderate loads, and who seek what will be economical in first cost, that can be operated for comparatively small expense and will have long endurance.

These machines will be sold for \$895 with flareboard express body, and the chassis will be sold at the factory for \$870. The plan for the production department is to build at least 2000 machines the present year to meet the demand of the company's representatives and to fill an order by Whiting, Ltd., one of the largest English motor vehicle distributors, which firm has contracted for all that the Koehler company can produce in excess of the requirements of its own agents.

### But One Type of Chassis.

The truck has a wheelbase of 129 inches and is equipped with a standard flareboard express body. It has been designed not only as an efficient carrier of full ton loads, but also to provide the speed for rapid transportation.

Standard and well known parts that are known for



and insures to an unusual extent cool operation of the motor in hot weather or in slow driving with retarded spark. A high-tension magneto supplies the ignition current and the carburetor is an automatic float feed type.

The cone type clutch is housed with the flywheel and the gearset. The selective sliding type of transmission gearset has three forward speed ratios and reverse. All gears are made from an alloy steel in which there is a percentage of nickel and the shafts are carried on annular ball bearings.

#### Internal Gear Rear Axle.

The rear axle is the internal gear drive type, which has grown enormously in popularity, especially for lighter trucks. The entire load is carried on a dead axle that is a solid steel drop forging. All working parts on the axle are mounted on roller bearings.

Both front and rear wheels are 34 inches in diameter and have 14 spokes, which are square and have a solid channel base. Tires are the standard size for this type of truck.

The frame is of steel channel section, cross supported at four points, and so designed that the radiator is well protected in front.

The springs used both at the front and rear are "graded." They are built up of leaves of four different thicknesses. They are very efficient in absorbing shocks that originate on the road. Special care has been given the design of the spring pads that are formed upon the axles for spring mounting and large carbon steel clips are used to prevent breakage of the springs. All

spring ends are bushed, as are the frame hangers and shackles. The shackle bolts are  $\frac{5}{8}$ -inch and  $\frac{7}{8}$ -inch diameter and are well provided with grease cups. The thrust and braking strains drive is taken through the springs, the rear ends of which are shackled.

The large steering wheel is located on the left side and the speed change and emergency brake levers are placed in the centre of the footboard for convenient operation by the driver's right hand. All of the control parts, such as the brake rods, are inside the frame.

The body is extra long, the loading space behind the driver's seat measuring eight feet six inches. The floor of the body is closer to the ground than in most similar trucks and this makes the loading or unloading of the truck unusually easy. It affords also a low centre of gravity, which improves the stability of the truck and makes skidding less likely.

Appearance has been given due consideration in the design of the truck. The colors used are double chrome green for the body and hood and an amber brown for the running gear.

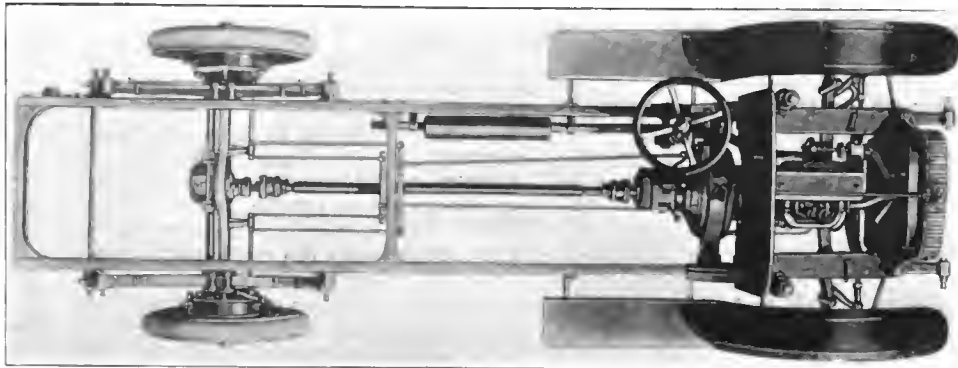
## WORK FOR SOLDIER DRIVERS.

### English Anticipate Host of Available Men after the War Ends.

How profoundly the war is expected to influence industrial and social conditions in England after the war is shown by the speculations of British trade journalists as to the direct and indirect effect upon motor drivers and mechanics.

The war has drawn into the army practically all the competent drivers who were employed in civil occupations before the war. In addition, great numbers of men have been trained to drive the army transports who previously knew nothing of them or of any mechanism. These men, at least many of them, will desire positions as drivers when they resume civil occupations, and there will probably be many more applicants for such work than there will be opportunities for employment.

Clerks and men who have worked inside, after having become accustomed to outdoor work, will be very



Plan View of the Chassis of the Koehler One-Ton Internal Gear Driven Truck, Showing the Simple Power Transmission System.

reluctant to take up their old inactive occupations and are likely to insist on some employment that will place them outside.

Meantime, thousands of women, old men and young boys, have been trained as drivers. The number of very young boys driving cars and trucks in England is such that there has been much complaint by the public against the additional highway risks that result from their recklessness and ignorance.

It seems certain that women will have a much larger place in the industries in England from this time on and that probably a larger proportion of men with mechanical knowledge will be available than at any time in the past.

William R. McCulla, who was assistant chief engineer of the Knox Motors Company, Springfield, Mass., has resigned and returned to the Packard Motor Car Company, Detroit, Mich., where he was formerly employed. He will have charge of engineering work in the aviation department.

### DEVELOPING FOREIGN TRADE.

#### Training Young Men and Financing with American Capital Are Necessary.

Dr. Edward Ewing Pratt, in the annual report of the Bureau of Foreign and Domestic Commerce, devotes much attention to the development of the foreign trade of the United States, in which the motor vehicle industry has had an important part during the past year.

He says that the great necessities for its future development are the training of American young men for foreign business and the financing of foreign enterprises by American money. He criticises business schools and business departments of university for not having as instructors in foreign trade subjects, men who have actual contact with export conditions and have more than a purely theoretical knowledge of the subject.

He says that most foreign buying is done from the nations that loan the money. Thus if English financiers back a South American railroad the material and equipment for the railroad are most likely to be purchased from English firms. Until the United States begins to participate in this financing there will not be much chance to expand export trade, he believes.

He urges that a larger appropriation be made to sustain the foreign trade service of his bureau.

### CUTLER-HAMMER EQUIPMENT.

Charging sets for electrical vehicles, designed to draw their energy from a direct current source of supply, are described in a booklet issued by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. The universal unit type for garages, which is built in sections and can be built up indefinitely, is described, as well as equipment for individual vehicle charging. The book also treats of rheostats for charging, ignition, starting and lighting batteries.

### SAFETY FIRST EXHIBITION.

During the week of Feb. 21 to 26 inclusive, there will be held at Washington, D. C., a "Safety First" exhibit, to which practically all of the governmental departments will contribute. Secretary Lane of the Department of the Interior has sent a letter to all the governors asking that each state send a delegate and that the chief mine inspector, a representative of the industrial commission, or other agencies engaged in compiling statistics relating to mineral industries, be allowed to attend. Manufacturers and operators from all over the country have been invited. There will be a conference of state mine inspectors at the Bureau of Mines Feb. 24.

### KNOX TRACTOR CATALOGUE.

One of the features of the new catalogue of the Knox Motor Associates, showing the various types of Knox tractors, is that section devoted to the new towing winch tractor. This tractor is made for use with a four-wheeled trailer

to be used in specially difficult operating conditions and mounted on the rear of the frame is a powerful winch, which has a draw bar pull capacity of 20,000 pounds. A heavy sprag is attached to the rear axle of the tractor, which will dig into the ground and hold the tractor firmly when the winch is in use. The idea is that on a very steep grade the tractor can climb the rise first with only its own weight and then draw the trailer up after it. A steel cable 150 feet in length is supplied with the winch, but a longer one can be used. The new catalogue shows a great variety of semi-trailers and the Knox tractor in use in widely diversified services.

### SHOW SAFETY FIRST FILM.

A moving picture film showing a thrilling escape from collision on the streets of New York was the feature of the first "Safety First Forum" held recently in the Hotel Biltmore, in New York City. It was intended to demonstrate the value in an emergency of the E. V. Hartford electric brake.

The film shows a Studebaker car running at 25 miles an hour and a trolley car running 10 miles an hour dashing at each other. Both are equipped with electric brakes and are brought to a stop in a remarkably short space just in time to prevent collision.

The automobile weighed 3000 pounds and the trolley car 16,000. Had the two cars met at the speed they were going, the blow, according to Herbert Chase, engineer of the Automobile Club of America, would have been equal to a gun muzzle energy of 113,500 foot pounds.

The film shows also a panorama of Fifth avenue with the traffic police operating their semaphores. Much of the film was taken from a moving Studebaker car. The picture showed some further trials of the motor and electric car on St. Nicholas avenue and some quick stopping trials on Fifth avenue.

When the film was made the trolley car company insisted on a bond that would pay for damages to its property if an accident happened and required that the life of the motorman of the trolley car be insured.

### LARGE BUSINESS IN TIRE SAVERS.

The manufacture and sale of tire savers and repair materials has come to be a large part of the tire maker's business, according to L. C. Rockhill of the automobile tire department of the Goodyear Tire and Rubber Company. Tire companies push this business for, while it reduces the sale of new tires by making the old ones last longer, it builds up the business more by pleasing customers. Many small repairs if made in time will greatly increase the wear that a tire will give. Motorists are paying more attention to tires, repair small damages more promptly, and are getting more mileage from their tires as a result.

### CHLORINE RUINED MOTOR CARS.

A ship which recently made a voyage to South Africa carried a large number

of American motor cars and a lot of chloride of lime in sealed metal containers. For some reason large quantities of chlorine gas were given off by the chemical during the voyage and this practically ruined the motor cars. In some cases the radiators were so badly eaten by the gas that a finger could be pushed through the metal. Working parts were corroded and seized. Every part of the machines were wet and clammy with a corrosive substance akin to hydrochloric acid.

There was green chloride over all the pipe work. The paper packing on the cars fell to pieces at the touch of the hand and it took four men to push a light car over the deck, so badly were the bearings corroded. In all 70 cars were more or less seriously damaged.

### MANY TRUCKS USE MAGNETOS.

A review of the trucks offered for sale this year indicates that of 149 makes, 138 use magneto ignition, and of these 75, or 50 per cent. employ Bosch equipment. Of the 74 other makes only 11 use battery systems of ignition.

The Bosch Magneto Company is much pleased by this showing for its equipment, and points out that users are paying more than they would for some other systems to obtain absolutely reliable ignition, which is very important when service dependability is a factor.

### REPAIRS SAVE TIRE MILEAGE.

Tires that are apparently worn out may have many miles of service left in them, which can be gotten out by taking advantage of the advice of a competent repair man, according to L. C. Rockhill, manager of the automobile tire department of the Goodyear Tire and Rubber Company.

Often a repair made with an inner tire liner or by retreading will pay big dividends to the tire owner. In the past some tire repair men have recommended repairs that were not practical and that did not yield enough service from the tire to pay for them, but repair men have learned the bad effects on their business of such erroneous advice and more and more of them can be depended upon to give reliable information on repairs.

### GOODYEAR WIRELESS SERVICE.

Three years ago the Goodyear Tire and Rubber Company conceived the idea of installing a wireless telegraph service between its Akron plants and the office in Detroit, where hundreds of thousands of tires are sold every year to manufacturers.

Securing large orders sometimes swings on acquainting the Akron factory with facts and conditions and getting a reply in a few minutes. The saving in time made possible by wireless messages has made the investment profitable. The Goodyear company was the first private corporation to install such a service, though several others have since done so.

Last summer, when the steamer *Noronic* was carrying the convention of the Society of Automobile Engineers, a daily



paper was published on board and news for it was furnished by the Goodyear wireless service.

The equipment has three coils arranged in series and is very efficient. Messages can be sent and replies received in 10 minutes, and this service has been completed in four minutes. For quick communication to western branches messages are often wirelessly to Detroit and placed on the telegraph lines there.

Sometimes messages are picked up from Arlington, Key West, Porto Rico, Cuba and Panama, and occasionally from ships on the Atlantic ocean. Not infrequently S. O. S. messages from lake ships are received and sometimes in heavy storms the Goodyear station has been the only one along the lakes that has not been disabled.

#### TIRE SIZES MUCH SIMPLIFIED.

Before the movement to bring about standardization of tires was inaugurated, some of the tire manufacturers made as many as 51 different sizes of pneumatic tires. Tires cost more than now and the large number of sizes was largely the cause of this greater cost, since it required a very large investment in factory equipment. The 51 sizes have now been reduced to nine standard sizes and nine over-size profiles. These are based on a study of carrying capacities of tires and fit satisfactorily every requirement. Individual tastes, which formerly were regarded, frequently led to over-burdened and short-lived tires.

#### CONLIN GOES TO MIDDLE WEST.

H. A. Conlin, formerly Rhode Island sales manager for the Federal Truck Sales Company of Boston and Providence, has been appointed sales manager for the Federal Motor Truck Company in the middle west. The demand in the western territory for Federal machines has increased remarkably, and great interest has been shown in the results of the traffic department's investigations of the exact cost of operating Federal trucks in different services.

#### UPSON APPOINTED OBSERVER.

Ralph H. Upson, aeronautic expert of the Goodyear Tire and Rubber Company, Akron, O., and a well known balloonist, has been appointed by the United States special observer of military aeronautics in the European war. He will officially represent the National Guard and will carry credentials from the War Department at Washington.

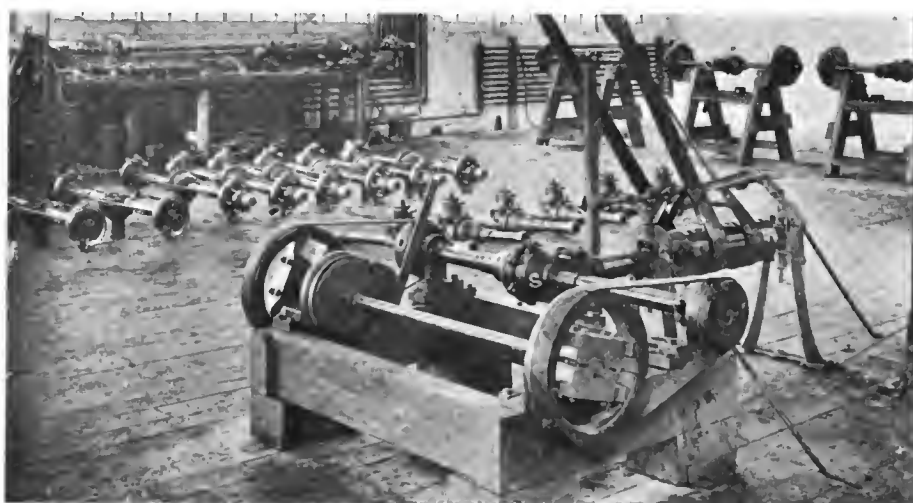
In Europe in 1913 he won the James Gordon Bennett cup with his balloon "Goodyear." This experience brought him into close contact with various aeronautic engineers there. Several months ago he was appointed a member of a special committee to co-operate with the Edison Naval Advisory Board in the consideration of the application of naval aircraft to warfare. He has taught a number of government men the fundamentals of ballooning.

#### ADJUSTING RUSSEL AXLES.

##### Shop Equipment for Testing the Setting of the Jackshaft Gears.

Practically all large manufacturers of motor vehicle components have equipment for testing and adjusting the parts they produce to obtain exact adjustment, and these are designed to obtain results that are even more accurate than would be possible by road operation. These methods are quicker and obviate assembling such as would be necessary in the tests that were formerly made, as well as being more economical.

Those who build machines require that the parts be delivered so that they can be assembled without special tests other than for alignment and they exact the highest class of work. The accompanying illustration shows the method adopted in the factory of the Russel Motor Axle Company, North Detroit, Mich., by which the bevel gears of the jackshafts of the internal gear axles are adjusted after assembly so that there will be per-



Machine for Testing the Adjustment of the Bevel Gears of the Axles Built by the Russel Motor Axle Company, North Detroit, Mich.

fect operation.

As will be noted, this is what may be termed a brake testing device. Pinions are mounted on the outboard ends of the driving axles or shafts when the axles are assembled, but in the tests pulleys are placed on the shafts instead of the pinions and these pulleys are coupled by belts to pulleys on the shaft of the testing machine. By means of a brake that is a part of the machine any desired load can be placed on the jackshaft, and as the axle requirements are carefully computed the gears can be adjusted to any setting that will afford the standard efficiency.

#### 70,000 TRUCKS LAST YEAR.

About 70,000 trucks were made in the United States in 1915, of which about 18,000 were shipped to Europe for war purposes. In 1916 about 125,000 trucks will probably be built in the United States. The value of the 1915 production was approximately \$50,000,000, and the 1916 output will have a valuation of \$100,-

000,000 if the present prices are maintained.

#### BOSTON TRAFFIC SEMAPHORES.

Semaphores at street crossings to enable the police to control both foot and vehicle traffic in connection with painted aisles and zones of safety are being tried by the Boston street commission. The system is very similar to that which was developed in Detroit and which has been applied in New York and other cities. The semaphores are of different design, however, and will carry electric lights with red glasses.

The introduction is largely due to the work of the Boston automobile clubs, which have had representatives at all hearings on the traffic questions to urge the adoption of this system.

#### WORCESTER BUYS NETCO TRUCKS.

The city of Worcester, Mass., recently purchased four trucks from the New England Truck Company of Fitchburg, Mass.,

for use by its street department. Three of them are to be equipped with dumping bodies, and one of them will be fitted with a tank body for oiling the roads. A dump body will be provided for use during the part of the year when the truck cannot be used for oil spreading. The bodies will be made in Worcester. The city also recently purchased several trucks of the same make for use by its fire department.

#### TRUCK HAULED GIRDER.

A great steel girder, 50 feet long, seven feet wide and weighing 12 tons, which was produced for use in a bridge, was hauled recently from Newark, N. J., to Pine Brook, that state, by a Garford five-ton truck owned by J. S. Gelger & Son, which towed a four-wheeled trailer behind it.

The girder was hauled 15 miles, during which the truck ascended a 12 per cent. grade. The trip was made in an hour and fifty minutes, including the climb up the long, steep hill.

## METZ DELIVERY WAGONS.

### One Type Chassis with Different Bodies and Starting and Lighting Systems.

The Metz Company, Waltham, Mass., builder of Metz pleasure cars, is now producing a type of chassis especially adapted for delivery purposes, which is designed for the service of those who have need of machines that will carry light loads and make fast time, and which can be driven long mileage whenever occasion demands. The Metz chassis is equipped with an engine of exceptional power and efficiency and the use of the Metz fiber grip gearless power transmission system obviates many of the possibilities for mechanical deterioration that is so certain to result from the constant use of a gearset for changing the vehicle speeds.

These chassis are 108-inch wheelbase and they are fitted with wood artillery wheels that are equipped with 31 by 3½-inch tires on clincher rims, but the wheels

and lighting system. The price of Model B is \$550, of Model C \$525, of Model D \$575 and of Model E \$600.

### FORD EXPANSION PLANS.

It has been announced by Frank Klingensmith, vice president of the Ford Motor Company, that plants in Detroit are to be trebled in size as rapidly as possible and that 100,000 men will eventually be employed there. Plans have been drawn and construction begun on the largest building ever authorized in one lot by the Ford company. These buildings will cost \$10,000,000.

### GRAMM-BERNSTEIN TRUCKS IN FRANCE.

The Gramm-Bernstein Company, Lima, O., builder of Gramm-Bernstein trucks, has made deliveries of a large number of machines that have been exported to England, and to France, those shipped to France being generally used for army service. The trucks intended for military transportation have special body equipment, the general character of which can be noted from the accompanying illustration.

For instance, the forward end of the chassis frames have been extended to serve as bumpers, and large sprags have been fitted to hold the machines on steep hills when hauling heavy loads. The cabs are somewhat different from conventional equipment and the bodies are fitted



**Gramm-Bernstein Trucks Equipped with Special Bodies, Bumpers and Sprags for Service of the French Army.**

can be equipped for demountable rims to take 32 by 3½-inch tires if the purchaser wishes this equipment. The type of body is designated by letter, there being three different styles—an express body, an express body with standing top and equipped with curtains, and an enclosed or panel body. There are other letter designations which indicate the lighting system.

Model A, for instance, is the open express body with the chassis fitted with Prest-O-Lite tank and gas head lamps and oil dash and tail lamps. This sells for \$500 complete. Model B is the same machine and body, equipped with a Gray & Davis electric lighting and starting system. Model C is the same chassis and body as models A and B with the standing top and side curtains, with the Prest-O-Lite tank and gas and oil lamps, and Model D is the same chassis and body as Model C with the Gray & Davis electric lighting and starting system. Model E is the same chassis with the fully enclosed panel body with Gray & Davis starting

and lighting system. The price of Model B is \$550, of Model C \$525, of Model D \$575 and of Model E \$600.

ted with bows over which tarpaulin covers are stretched to protect the loads or to afford shelter for the passengers. The bodies are built to meet the French army specifications.

### FREIGHT CAR SHORTAGE SERIOUS.

The freight car shortage has become so serious in Detroit that some makers have found it necessary to lessen production because there is no place in which to store machines when completed pending shipment. Dealers throughout the country are very much disturbed over this condition, as they have been trying to get deliveries in quantity and are urging their customers to buy early in order to avoid possible increases in price due to shortage of materials. Export shipments are being made on flat cars and when an empty car is discovered anywhere in Detroit machines are towed or driven there and loaded on the spot rather than take a chance of losing the car during switching.

## THREE WORM-DRIVEN UNITED STATES TRUCKS

**M**ANUFACTURING machines to meet the requirements of those who desire either the worm or chain driven type, the United States Motor Truck Company, Cincinnati, O., is now producing five different chassis, two of which, models E and D, are respectively two and three tons load capacities, and have side chain power transmission, while models H, J and K are two, 3½ and five-ton load capacities and have worm power transmission system. These vehicles, in the order of models stated, are sold for \$1900, \$2400, \$2200, \$2800 and \$3600.

The company has 16 years' manufacturing experience and has built trucks for a number of years. It has always produced machines that have been carefully designed and systematically developed, and these vehicles have afforded exceptionally satisfactory service, being economical of operation and enduring unusual periods in all classes of work. The company for the greater part of its existence disposed of its trucks to a very large extent in the middle west, but later its capitalization and factory facilities were increased materially and production was begun on a very much larger scale.

The company has carefully selected manufacturing equipment and it is now producing machines that are regarded as being unusually well designed, that are extremely simplified, that have qualities that recommend them to those who desire dependable vehicles of high grade, and are adaptable for any work for which motor trucks can be used. The plan of the company is to distribute its vehicles very generally and to conduct an aggressive sales campaign that will stimulate the endeavors of carefully selected agencies in the principal commercial centres of the country.

The worm shaft and gear system of power transmission has been adopted for the three latest types of trucks, and these machines are built to what may be regarded as a standard design, there being practically no variance aside from the differences in the proportions of the parts. This design differs somewhat from the chain driven trucks, and embodies all the refinements that have been demonstrated by experience to be desirable or necessary to high efficiency.

### The Two-Ton Chassis Construction.

For the purposes of description the two-ton chassis has been selected as representative, and this will be

dealt with in the statements that follow. While following standard practise closely the chassis has characteristics that differentiate it from other makes, one of which is the mounting of the engine and clutch on a sub-frame that is carried at the forward end on helical springs and at the rear end on a large ball and socket, so that it is suspended at three points and cannot be affected by chassis distortion, while practically all the vibratory stresses are absorbed.

The power plant is a United States-Continental engine, a four-cylinder, four-cycle, water cooled, L head type, having a bore of 4⅞ inches and stroke of 5¼ inches. The horsepower rating by the S. A. E. formula is 27.2, but the claim is made that it will develop 40 horsepower at approximately 1500 revolutions. It is



Worm Driven Two-Ton United States Truck Chassis Equipped with Cab Ready for Installation of a Body.

the development of long experience and the production of a concern that is recognized the world over for the excellence of its engines for all classes of service.

### Cylinders and the Crank Case.

The cylinders are cast en bloc from a high-grade gray iron with the water jackets integral, the head of the jacket being a large cover plate that is secured by a series of cap screws. This construction insures complete clearing of the water passages and freedom of the circulation. The castings are first tested by water pressure for leaks and defects, after which they are rough bored and aged, this insuring against distortion from machining strains. Then they are reamed and ground and tested for the second time by water pressure. These pistons are cast from the same material as the cylinders and after being turned are ground to accurate fit. Each piston is channelled for three diagonally split eccentric expansion rings, and the rings

are specially machined to relieve all expansion strains and are carefully ground on the sides and faces. Oil grooves are turned on the pistons to collect and equally distribute the lubricant on the walls of the cylinders.

The crank case is cast from aluminum in two sections, both of which have a forward extension to house the timing gearset. The upper section is divided by a central vertical web which carries the centre main bearing, and the lower section is divided by a transverse horizontal web that forms the base of the crank chamber and in which are the troughs for the accumulation of oil beneath the big ends of the connecting rods. Below this web is the oil reservoir. The capacity of the reservoir is three gallons. The sections

carbon steel with the cams integral that is first turned and then the cams are rough machined. The shaft is then heat treated and next ground to accurate size on a special camshaft grinding machine. This shaft is so constructed that it may be withdrawn from the case by removing the cover of the timing gearset case.

The timing gears are helical cut, much care being taken to accurately maintain the gear centres, so that these are practically noiseless in operation. The set consists of a crankshaft, camshaft, pump shaft and an idler gear, and it is housed in the extension of the forward end of the crank case.

#### Connecting Rods and Bearings.

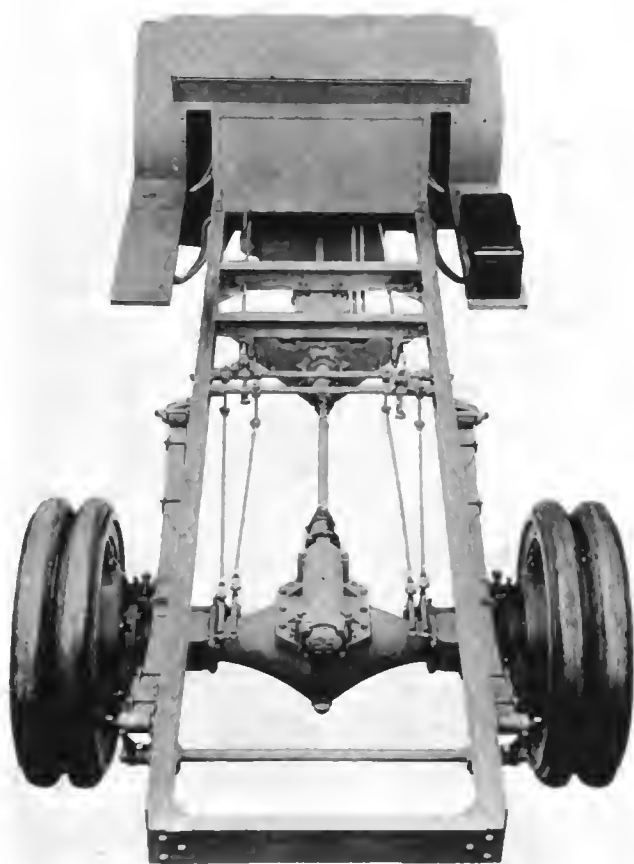
The connecting rods are I section, drop forged from .35 carbon steel, and are heat treated. The caps are retained by nickel steel bolts, the nuts of which are locked. The wristpins are made from special annealed steel tube which are hardened and carefully ground to size. Much care is taken to obtain perfect piston alignment. Special machine tools are used for boring and reaming the wristpin holes, and equal attention is given to the bearing seats of the connecting rods. The rods are bored and reamed by special machines.

The crankshaft is  $1\frac{1}{4}$  inches diameter and the bearings are, from front to rear,  $2\frac{9}{16}$ , three and  $3\frac{13}{16}$  inches length respectively, a total bearing length of  $9\frac{3}{8}$  inches. The camshaft is  $1\frac{1}{16}$  inches diameter and the bearings are, from front to rear,  $2\frac{1}{4}$ ,  $1\frac{7}{8}$  and  $1\frac{7}{8}$  inches diameter respectively, and in the same order are  $2\frac{5}{16}$ ,  $1\frac{1}{2}$  and  $1\frac{1}{4}$  inches length. The connecting rod bearings are  $2\frac{1}{2}$  inches length. The crankshaft, camshaft and connecting rod bearings are high-grade nickel babbitt metal, and the crankshaft and connecting rod bearings are seated in bronze cages, being secured by brass retaining screws. The connecting rod bearings are fitted with steel shims to obtain accurate adjustment. The wristpins are fixed in the piston bosses by cap screws that are securely locked, and the connecting rods oscillate on the pins, the small ends of the rods being bushed with bronze. All the bearings are expanded and reamed and finished by burnishing.

#### The Valve Mechanism.

The valve ports are two inches diameter and the valves are nickel steel heads, electrically welded to carbon steel stems. The clearance is such as to insure complete scavenging of the cylinders and the admission of full charges of fuel. The ends of the valve stems are hardened and the stems are fitted with oil tempered springs. All valves are interchangeable. The valve tappets are a mushroom type, of special steel, with the heads and stems ground to size. They are fitted with adjusting screws and locking nuts. Both valves and tappets operate in long guides. The valve mechanism is enclosed by cover plates that may be easily removed.

The engine is cooled by a circulation of water through the jackets and a horizontal square tube radiator with a core that is mounted in an outside shell of 18-gauge brass, riveted and soldered. The radiator is



Rear End View of a Two-Ton Worm Driven United States Truck Chassis, Showing the Mounting of the Transmission Gearset.

of the crank case are retained by a series of bolts, and the lower portion can be removed for work on the connecting rod or main bearings. Pockets are formed in the wall of the upper section of the case to collect oil for the lubrication of the camshaft bearings.

#### Crankshaft, Camshaft and Gearset.

The crankshaft is a three-bearing type that is drop forged from a special alloy steel that is heat treated so as to have a tensile strength of 90,000 pounds to the square inch. The flywheel flange is forged integral with the shaft and there are flanges at either side of the centre bearing to take the thrust from the clutch or other end pressure upon the driving shaft. The shaft is carefully machined and ground to size. The camshaft is drop forged from a single piece of low



The Engine and Clutch on the Two-Ton United States Chassis, Mounted in a Spring Supported Sub-Frame.

carried in a cradle that is suspended between four helical springs that effectually protects it. The water is circulated by a centrifugal pump of large capacity. Radiation is promoted by a fan mounted on an adjustable bracket on the forward end of the cylinder block that is driven by a flat belt by a pulley on an extension of the pump shaft.

#### Lubrication and Ignition Systems.

The lubrication system is a combination force feed and splash. The oil is drawn from the reservoir by a double vertical plunger pump driven by eccentrics from the camshaft and forced through copper tube to the rear main bearing and the timing gears. The excess oil drains to the base of the crank chamber and is distributed by splash to the cylinders, pistons, wristpin and camshaft bearings, the centre and forward main bearings, the cams and the valve tappets. The overflow of oil is drained to the reservoir and is filtered by a screen about the pump inlet. A sight indicator shows the volume of oil in the reservoir.

The source of ignition current is a Bosch high-tension duplex magneto and a battery of dry cells, using one set of spark plugs, the systems being controlled by a lock switch on

the dash. The carburetor is an automatic float feed type, having a hot air connection with the exhaust manifold. The clutch is a leather face cone of conventional design.

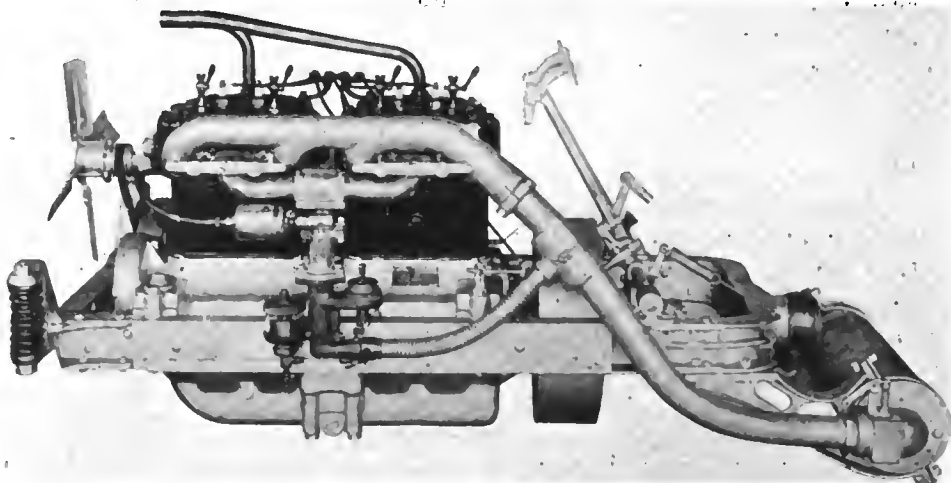
#### Mounting of the Power Plant.

The engine and clutch are mounted on substantial sub-frame at four points. The sub-frame suspension is not new with United States trucks, but it is decidedly interesting. The ends of the forward member of the sub-frame are yokes through which are vertical pins on which are two helical springs. The eyes of heavy brackets riveted to the side members of the frame are between the springs, so that there is resistance to all shocks and vibration. There is a globe five inches diameter in the centre of the rear sub-frame member that is mounted in a socket on a V-shaped frame cross member. The side members of the sub-frame are filled with hard wood flush to the edges of the channels, this preventing strains from distortion and there are hard wood bumpers at the rear end of the sub-frame that contact with the main frame when the distortion is extreme. With this construction the power plant is insured against stresses of every kind. At the rear end of the sub frame are brackets on which are mounted the muffler, which is placed crosswise.

#### Power Transmission System.

The clutch shaft extends through the centre of the globe, carrying the sub-frame to the selective type sliding clutch transmission gearset, which is carried by two frame cross members and is mounted on three points. The gears are always in mesh. There are three forward speed ratios and reverse. The coupling of the main shaft to the countershaft is by a heavy dog clutch which slides on a squared section of the shaft, meshing with a dog clutch cut integral with a gear. On direct drive movement of all gears cease. The gears are  $1\frac{1}{8}$  inch face. The gears and shafts are highest grade metal. There is a fully enclosed grease-packed universal joint between the clutch and the gearset.

The power is transmitted from the gearset to the



The Engine, Clutch and Muffler in the Sub-Frame, Which Construction Is Characteristic of United States Trucks.



rear axle by a short shaft with a universal joint at either end. The rear axle is a Sheldon construction of the David Brown type, and it is a semi-floating design. The axle housing is a steel casting with a large central section having a cover in which is mounted the worm shaft, the gear wheel and the differential gearset assembly. This can be removed as a unit. The axle shafts are of large size and these may be either mounted with annular ball or roller bearings at the option of the purchaser. The spring seats are integral with the axle housing. The front axle is a substantial I section vanadium steel drop forging, two inches width and three inches depth, dropped five inches in the centre with the pivots of the steering knuckles fitted with ball thrust bearings.

#### **The Frame and Chassis Details.**

The frame is rolled steel channel section five inches width, with webs  $1\frac{3}{4}$  wide. It is strongly reinforced and gusseted. On this frame side members are two by three-inch steel angles to serve as guides for the body sills. The frame is carried on semi-elliptic springs, the forward set 44 inches length and  $2\frac{1}{2}$  inches width, and the rear set, outside the frame 48 inches length and  $2\frac{1}{2}$  inches width. The spring plates are ribbed at the ends and two rebound clips are fitted to each spring. The torque and driving thrust and the braking stresses are taken by the springs, there being no radius rods. The wheels are a wood artillery type, fitted with 34 by  $3\frac{1}{2}$  solid tires forward and 36 by  $3\frac{1}{2}$  dual solid tires at the rear.

The steering gear is a heavy worm and sliding block type that is placed at either the right or left side as desired by the purchaser. The gear is irreversible and is turned with a 20-inch hand wheel. The drag link is mounted ahead of the axle and has ball and socket joints at either end. There are the usual foot pedals for the clutch and the service brake, hand levers on the steering wheel for the ignition and throttle control, a foot accelerator and hand levers at the centre for shifting the gears and operating the emergency brake. There is an interlocking device which locks the gear shifting lever in both the in and out positions, which is operated automatically by the action of the clutch release pedal. It is a safeguard against the changing of clutches of the transmission gearset without first releasing the clutch and insures against damage of the gears.

The service and emergency brakes operate within and on large steel drums on the rear wheels, and these are equalized so that they are positive in action regardless of adjustments. The seat is constructed of steel angles bolted to the side members of the chassis to form a frame with panels of sheet steel riveted to the frame. Under this is installed the 20-gallon gasoline tank. The chassis equipment includes the driver's seat, fenders for the front wheels, horn, oil dash and tail lamps, kit of tools, jack, tool box and battery box on the running boards and hub odometer.

#### **BOSTON'S MOTOR ACCIDENTS.**

In his 10th annual report to the Governor of Massachusetts, Police Commissioner O'Meara of Boston called attention to the fact that 45 persons were killed and 852 were injured in Boston during the year, and that in not a single instance did "street congestion" have any influence on the accident.

Forty of the persons killed were walking in the streets and five were in motor cars. Two of the latter were in cars which came into collision with trolley cars, one in a motor car which overturned, one in a car that struck a telegraph pole, and one in a motor car in collision with another motor car.

Of the 40 pedestrians, three were on sidewalks and were killed by skidding cars, while the remaining 37 were killed in the roadways. Of the 40 deaths, 22 were caused by private motor cars, five by dealers or other semi-public cars, and 13 by trucks. Eight of the 22 passenger private cars were driven by their owners and 14 by other persons; one of the trucks was driven by its owner.

The ages of the 37 killed in the roadways were from two to 10 years, 18; 10 to 16 years, six; 23 to 50 years, 3; 50 to 60 years, five, and 60 to 75 years, five.

During the year 4172 prosecutions were made under the automobile law. These do not include charges against drivers for violations of the park rules or of traffic regulations which were not in violation also of the auto laws. This was 343 more prosecutions than in 1914.

#### **NEW PROCESS GEAR'S NEW PLANT.**

The New Process Gear Company of Syracuse, N. Y., has bought the plant of the Monarch Typewriter Company in that city and has planned a large increase in its manufacturing facilities. Five acres of land were purchased along with the plant. A new building four stories high and 120 by 100 feet has also been built. A bridge across a small creek connects this building with the main plant.

#### **BIG REGISTRATION IN NEW YORK.**

Receipts amounting to \$1,905,153 were taken in by the office of the secretary of state of New York for the 11 months ending Dec. 31, 1915, as compared with \$1,618,060 for the full 12 months of 1914.

Up to Jan. 1, 1916, 233,325 automobiles were registered in New York state by owners and dealers; 231,126 by the former and 2199 by the latter. During the same months in 1914, 169,966 cars were registered, or 61,160 less than during 1915.

W. L. King & Co., Oakland, Cal., is now a sales agent for F. W. D. trucks, made by the Four Wheel Drive Auto Company of Clintonville, Wis.

### WORK FOR WAR BROKEN MEN.

The attention of the belligerent countries is being seriously given to the task of finding jobs for men who return from the front so maimed that they cannot follow their former occupations. Many who did work requiring both hands have come back with only one hand and some who required both legs, as for instance chauffeurs, have lost one or both legs.

Studies are being made of the various tools in use in factories to make it possible for these maimed men to operate them. One of the leading motor trade papers in England has arranged to publish free advertisements for employment for injured men who have returned from the war and are seeking work.

### ELECTRIC TAXICABS FOR NEW YORK.

The effort made by Irvin Scrimger and the Detroit Taxicab and Transfer Company, which he represents, to introduce into New York City electric cabs, such as the company has been operating in Detroit for many months, is to have the backing of the New York Edison Company and the Electric Vehicle Association.

The plan is being promoted along lines that are entirely original in New York and the good appearance of the cabs, their excellent performance and the fact that they can be operated at about half the expense of gasoline cabs makes it practically certain that under some plan they will be introduced into the Metropolis.

The project for a new motor 'bus franchise is being opposed unanimously by all the public service corporations in New York and their influence appears to have delayed its acceptance by the board of estimate. The decision on the petition will probably be made known in a few weeks, however.

### BURD AEROPLANE MOTOR RING.

The Burd High Compression Ring Company has been co-operating with engineers engaged in perfecting high-speed motors to be used in war aeroplanes. The result is a new high-speed ring with which but a normal volume of lubricating oil is necessary. It will be exhibited for the first time in public at the Chicago automobile show. Aluminum alloy pistons, which expand more than cast iron pistons when they are warmed, have been fitted in large number with Burd rings, which are so made that they will expand sufficiently so that there is no abnormal stresses and efficient maintenance of compression.

### CO-OPERATIVE DELIVERY.

#### Steady Growth of a General Store Service at Champaign, Ill.

Perhaps the most complete system of co-operative delivery operated in any city in the United States exists in Champaign, Ill., where practically every store delivers its goods through the same co-operative system, using gasoline trucks.

One of the big wastes in the individual store distribution system is the fact that delivery and hauling equipment for both wholesale and retail establishments is not fully occupied or that it is operated much of the time without full loads.

The Champaign organization, which aims to cut out this waste, was formed last spring as the Champaign Delivery Company with 20 members. It now has 40. The company has property worth \$20,000 and



A Jeffery "Quad" That Is Used for Carrying Freight and Passengers in Alaska. Where the Machines Often Have to Make the Roads.

all of the stores who use the service are stockholders.

Some idea of the saving effected can be gained from the fact that all the stores who joined turned in their old delivery equipment and there was found to be more than twice as much as was needed for the co-operative establishment. There is a manager, a woman clerk, a mechanic and 20 drivers employed by the organization.

There is a central delivery station. Each wagon picks up parcels down town, goes to the central station, unloads those on other routes and takes on those for its own route through the residence district. This sorting usually occupies 30 minutes previous to each delivery trip, and as many deliveries are made as the demands of different businesses necessitate.

The charge made for delivery is 3½ cents up to 100 pounds, with a proportionate charge above that. If the company makes money it is paid back to the dealers as dividends. The company does a cash business, tags entitling a store to delivery being sold in 1000 lots.



## WHAT IS STEEL?

By Urban A. Mullin, Chief Chemist, Hyatt Roller Bearing Co.

The leading paper of a town of 60,000 came out one day with a front page article telling of the discovery of a steel mine. Probably but one in a hundred would crack a smile at that, so for the benefit of the 99 let us state that steel, by its very definition, is a manufactured product.

The source of steel is iron ore, which may be considered as iron which has oxidized or rusted through long contact with air, moisture, etc. This ore is smelted in a blast furnace, the charge consisting of alternate layers of ore, coke and limestone, and the process is continuous, charging at the top and tapping or drawing off from the bottom.

Briefly, the coke supplies the necessary heat, and also breaks up the ore into its component parts, iron and oxygen. The oxygen units with the coke and passes off as a gas. The iron melts and flows down to the bottom of the furnace, and is drawn.

Both the ore and the coke contain impurities. Some of these unite with the melted iron, and the rest unite with the limestone, forming a light slag, which floats on the melted iron and is drawn off separately. The metal from the blast furnace is called pig iron. When pig iron is melted in a cupola and cast again in some finished form (casting) it is called cast iron.

When it is put into a steel furnace, of which there are various kinds, and treated so that the impurities which were picked up in the blast furnace are partly, and sometimes almost entirely, eliminated, the resulting product is steel, and it is called crucible, open-hearth, Bessemer, etc., according to the kind of furnace it was made in.

The line between steel and cast iron is difficult to place, but is usually decided by these three factors: Kind of furnace used (whether cupola, open-hearth, etc.), amount of carbon present (the dividing line usually placed at 2 or 2.2 per cent.), and by the malleability, steel being malleable while cast iron is not.

Steel owes its properties to the impurities which it contains, and for that reason they should be called alloying elements instead of impurities. If the distinctive properties of a steel are due to any one or more elements, the steel takes its name accordingly; for example, carbon steel, chrome vanadium steel, etc. Each element or combination has its own distinctive effect on the steel; for example, high sulphur makes it hot short (brittle when hot); high phosphorus makes it cold short; high carbon makes it strong, but brittle, and also makes possible tempering or heat treatment; high manganese makes it non-magnetic; high tungsten, together with chromium, makes it permanently magnetic, once it is magnetized.

Chromium and vanadium together enable us to get greater strength, with less brittleness, than would be possible with carbon only. Some of these alloying elements are present in the steel naturally and others are

added while the steel is molten, either in the furnace or the ladle. From this it can be seen that a steel which would be good for one purpose might be useless for another—you couldn't use razor steel for nails, because the first blow of the hammer would break it.

The idea, then, is to find out what kind of steel you want, and get it. Long experience and many experiments have shown what is best for the various parts of the Hyatt quiet roller bearing, and steel for each of those parts is brought under rigid specifications. The percentage of each alloying element is specified, and it is the business of the chemical laboratory to analyze all steel before it is used, to make sure that it corresponds with specifications.—Hyatt Quiet Type.

## S. A. E. RECOMMENDS LIGHT ADJUSTMENT.

The committee of the Society of Automobile Engineers which has spent two years studying the subject of headlight glare, has reported that excessive brilliancy can in most cases be eliminated and the lights brought within the requirements of the most stringent headlight laws by proper focussing the bulbs in the reflectors and by bending the standards so as to throw the light down on the road.

Better methods of designing lamps and bulbs were also discussed by the engineers with a view to securing the adoption of improvements in the cars to be produced by the manufacturers.

Standards for license plates, automobile springs, electric vehicles and iron and steel specifications, and methods of testing them were also recommended.

## MOTOR STREET CLEANERS FOR OTTAWA.

The United States consul at Ottawa reports that trials are to be made by the city of Ottawa next year with a view to adopting motor vacuum cleaners and pressure street flushers. The city has 42 miles of pavement, mostly asphalt, which is cleaned every day. Forty-five sprinklers and three flushers of the air pressure type are employed for this purpose. No mechanical sweepers are owned by the city, but 90 "White Wings" do the work. Most of the equipment now in use is built in the city's own shops.

In Detroit from July 2 to 6 will be held the World's Salesmanship congress. The motor trade is represented on the committee by Hugh Chalmers, Harry W. Ford, E. Le Roy Pelletier, Lee Anderson, Frank G. Eastman, H. H. Hills, Paul Smith and Norval A. Hawkins.

Throughout the middle west the rapid adoption of motor vehicles instead of horses for city work is bringing into existence municipal garages, which in many cases replace the stables that were formerly maintained by the cities.

## FOUR SIZES OF KISSELKAR TRUCKS.

**I**NDICATIVE of its purpose to devote even greater attention to the development of the business of its commercial vehicle department, is the production by the Kissel Motor Car Company, Hartford, Wis., of a new series of KisselKar trucks. For three of the models included in this series a David Brown type of worm drive rear axle has been adapted. In addition to the worm driven types there has been included a 1000-pound delivery wagon that has the bevel gear type of drive.

The capacities of the worm drive models are 1500 to 2000 pounds, 2000 to 3000 pounds and 3000 to 4000 pounds. The first mentioned is designed to meet the requirements of the retail and wholesale delivery trade; the second, for varied lines of manufacturing, merchandising and municipal uses; the third, for heavy duty work.

The constructional detail of the David Brown type rear axle includes 56-inch track and 39-inch spring centres; mounting of the worm wheel and differential as a unit in a cast steel carrier in the centre of the axle shell; and a spacious oil reservoir in the lower part of the axle housing. These are a full-floating axle, the weight of the truck and its load being carried on heavy steel tubes.

### Practically One Design Adopted.

The details of construction of the worm driven machines are practically the same. The proportions of some components vary according to the size of the chassis. Therefore, a description of the 1500 to 2000-pound chassis would apply to the other two sizes, except where noted as otherwise.

The motor is a Kissel built, L head, four-cylinder, en bloc cast type, with cylinder bore of  $3\frac{7}{8}$  and stroke of  $5\frac{1}{2}$  inches. The cylinder measurements of the engines of the 2000 to 3000 and the 3000 to 4000 chassis are  $4\frac{1}{4}$  by  $5\frac{1}{2}$  inches. The horsepower rating according to the S. A. E. formula is 32 for the lighter truck and 36 for the other two models. The valves are of a special quality steel and are thoroughly enclosed in compartments that are oil and dust proof. The valve covers can be removed quickly. Drop forged and heat treated I beam section connecting rods are used.

The construction of the camshaft allows ready removal without disturbance to the bushings. The shaft is an integral forging of high grade, scientifically hardened special alloy steel.

### Some Details of the Engine.

The aluminum crank case is in halves, the lower section being removable without taking the engine from the chassis. This part is the oil reservoir, while

the upper half carries the main bearings. The crankshaft is a drop forging of high quality steel and is mounted on babbitt faced, steel backed bearings.

The power plant is a unit and is suspended at three points. Its construction is such that it can be taken from the chassis by first demounting the radiator and detaching the motor connections.

The engine lubrication is by a combination force feed and splash system, with a constant oil level supplied from a reservoir in the lower part of the crank case. The oil is forced through tubes to the main bearings and the excess oil drains to the troughs under each of the connecting rods in the base of the crank case by a positive driven pump. The lubricant is strained each time it passes through the pump.

The carburetor is an exclusive Kissel-Stromberg design, which is hot water jacketed and is provided with shut off equipped intakes. The fuel feed is by a



Chassis of the Kissel Kar Worm Driven Truck Having Maximum Load Capacity of 3000 Pounds.

Stewart-Warner vacuum system. The tank has capacity of 20 gallons.

In the cooling system the water is circulated by a centrifugal pump through a very efficient radiator. The capacity of the system is  $5\frac{1}{2}$  gallons. The fan has six blades and is 18 inches in diameter. It is driven by belt. Motor speeds are automatically controlled by a governor, which is sealed and enclosed.

A cone type clutch, leather faced and having adjustable spring inserts, is employed. Adjustment is made through the floor of the truck body.

### Three and Four-Speed Gearsets.

The transmission gearset is a three forward speed ratio type. It is attached to the clutch through Spicer grease packed universal joints. The transmission gearset of the 3000 to 4000-pound chassis is a four forward speed ratio type and is attached to the motor by bell housing.

Automatic government of speeds is provided for as follows: The speed of the 1500 to 2000-pound and the 2000 to 3000 models is governed on third speed to 20 miles, on the second to 10 miles and on low to five

miles. In the 3000 to 4000-pound type, the speeds are: 16¾ miles on fourth, 14 on third, eight on second and four on first.

#### The Worm Drive Rear Axles.

In the worm drive rear axle is found a feature of construction that distinguishes this series of KisselKar trucks from others produced by the company. It is the well known David Brown full-floating type, in which the worm shaft, the worm wheel and the differential are mounted in unit on a cast steel carrier bolted to cover plate of the centre section of the housing of the axle. This construction is so designed that it can be assembled or disassembled without removing the axle from the truck, and that there is a spacious oil reservoir, with automatic oil level and filter, in the lower part of the axle housing. This affords constant lubrication of all bearings in the axle.

The frame is a ¼-inch gauge pressed steel section, 4⅞ inches width in the 1500 to 2000-pound chassis, five inches width in the 2000 to 3000 model, and six inches width in the larger size truck.

The measurements of the chassis are different in each size of truck. The smaller model's dimensions in

inches long, while the rear are three inches wide and 54 inches long.

The steering gear is a split nut and worm type, semi-irreversible, with adjustable ball thrust bearing. The drive is from the left hand side and the gear shifting and emergency brake levers are in the centre. The service brake is internal expanding on the rear wheels and is operated by a foot pedal. The emergency brake is internal expanding on the rear wheel drums and is operated by hand lever. Both brakes are equalized.

The wheelbase measurements of the three models are 125, 140 and 144 inches, and the turning radius is 25 feet. The wheels are heavy artillery types to S. A. E. standards. The front wheels on the 3000 to 4000-pound chassis are 34 inches in diameter, and those in the rear, 36 inches in diameter.

#### Types of Body Equipment.

The body supplied as standard with the lighter chassis is an express type, seven feet long and 44 inches wide. Its height from the ground when loaded is 32 inches. A stake body is standard on the 2000 to 3000-pound model, it being nine long in the clear and 44 inches wide. The height is the same as the lighter model. A stake body is also supplied with the heavier model. It is 10 feet by five feet five inches. Its height is 41 inches from the ground when loaded. The standard finish is Kissel blue with other colors as optional if not requiring unusual treatment.

The company will make any kind of a body for these chassis to order or will furnish blue prints when the purchaser desires to have the body made by

a local coach maker.

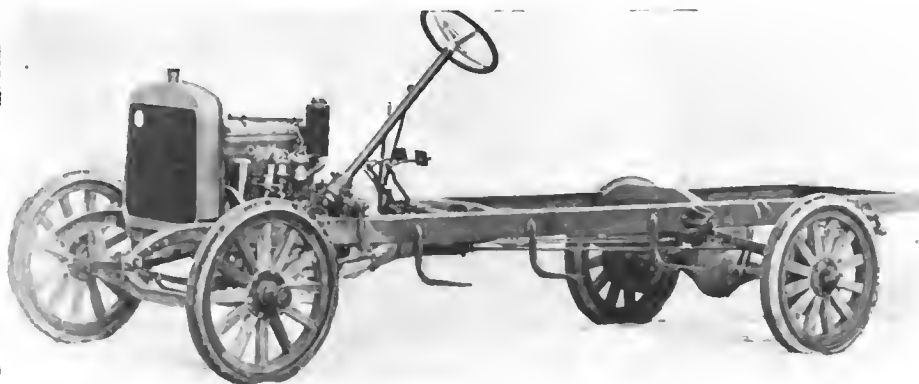
The price of the 1500 to 2000-pound chassis in two coats of lead is \$1500 f. o. b. factory. When supplied with the express body painted Kissel blue with black gear, the price is \$1650. When electric engine starter and lights are specified by the purchaser, \$150 is added to the price. If the wheelbase or length of frame is increased, the company makes an extra charge.

The price of the 2000 to 3000-pound chassis in two coats of lead is \$1750 f. o. b. factory. If supplied with either express or stake body the price would be \$1900. Electric engine starter and lights and increased wheelbase and length of frame are charged for extra at the same rates as for the lighter model.

The 3000 to 4000-pound chassis in two coats of lead sells for \$2100 f. o. b. factory, and when equipped with the standard stake body, at \$2250. As for the other two models an engine starting and lighting system and increased wheelbase and frame are extra.

#### The 1000-Pound Delivery Wagon.

The fourth member of the new KisselKar series is a 1000-pound delivery model, which sells for \$950. It



Stripped Chassis of the KisselKar Worm Drive Truck Having Maximum Load Capacity of 2000 Pounds.

inches are: Length over all, 179; width over all, 68; dash to rear of frame, 126; rear of seat to rear of frame, 84; extreme width of frame, 34; height of top of frame in rear from ground, 28½ loaded; width of driver's seat, 40½; depth of seat, 19; seat to dash, 25.

The dimensions of the 2000 to 3000-pound model in inches are: Length over all, 203; width over all, 68; dash to rear of frame, 150; rear of seat to rear of frame, 108; extreme width of frame, 34; height of top of frame in rear from ground, 29 loaded. The seat sizes are the same on all chassis.

The chassis measurements of the 3000 to 4000-pound truck in inches are: Length over all, 220; width over all, 71; dash to rear of frame, 162; rear of seat to rear of frame, 120; extreme width of frame, 34; height of top of frame in rear from ground, 29¾ loaded.

The weights of the chassis are 2800, 3400 and 4300 pounds. Semi-elliptic springs are used front and rear on all models, those on the 1500 to 2000 and the 2000 to 3000-pound trucks being 2¼ by 38 inches at the front and 2½ by 50 inches at the rear. The front springs of the larger model are 2½ inches wide and 38

is different from the other models in that it is driven by bevel gears instead of by a worm shaft and worm wheel. In other details it resembles the other units of the series, except that some components are smaller to conform to the lighter weight of the model.

The same type of 32 horsepower unit power plant is used, and other details of the chassis are practically the same. The weight of the chassis is 2200 pounds, the wheelbase is 115 inches and the turning radius is 22 feet.

It has a selective type sliding gear transmission gearset having three speeds forward and reverse, and power is transmitted by a shaft having two Spicer universal joints. Timken roller bearings are used in the axles, while the bearings of the steering gear are of the ball type.

The length of the chassis over all is 169 inches and the width is 68 inches. The length from dash to the rear of frame is 117 inches and from rear of seat to rear of frame 75 inches. Height of the top of the frame from the ground when loaded is 27 inches. The driver's seat is the same size as in the other models. Wheels are of the heavy artillery type and are equipped with 32 by four-inch pneumatic tires front and rear.

This chassis in two coats of lead is priced at \$950 f. o. b. factory. With the standard painted Kissel blue express body, which is six feet three inches by 44 inches and is 32 inches high above the ground when loaded, the price is \$1075. As for the other models an extra charge is made for an electric starting and lighting system and special size of frame or wheelbase.

The four machines complete the series of Kissel-Kar trucks, which will meet the requirements for all kinds of transportation, from the light, fast delivery of light loads in a large business zone up to the haulage of heavy freights. The Kissel designs have been carefully developed and proven from service to be economical and enduring, and they are so simplified that they can be given attention in any garage or public service station by mechanics of average experience.

#### STARTERS ADOPTED FOR TRUCKS.

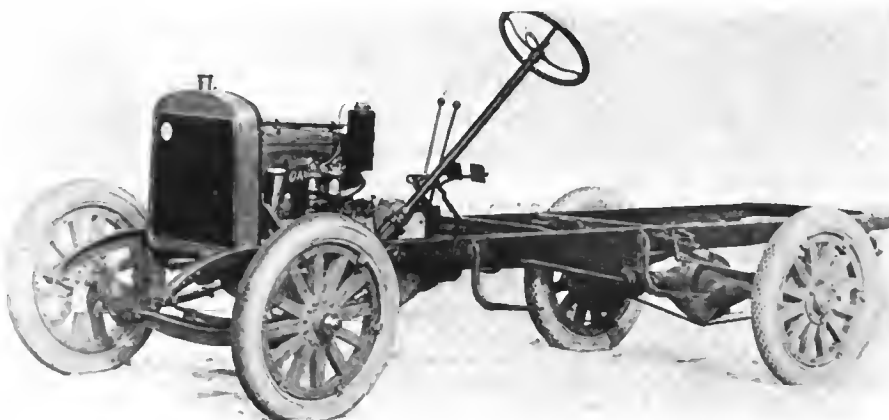
It has been announced that the Denby Motor Truck Company, Detroit, Mich., has adopted the Disco starter for use on its trucks. A unique installation has been worked out after much experiment by Chief Engineer Freeman of the Denby company. Many truck builders, especially those producing lighter types, are adopting engine starting systems. Among those using the Disco are the Detroit Package Wagon and the Detroit Motor Truck companies, the latter being of Waterloo, Iowa.

### THE USED TRUCK SPECTRE.

#### British Industry and Trade Fear Sale of Machines After the War.

Motor trade interests in Britain are again discussing the disposal of military trucks after the war is over. This was a favorite subject of discussion when the conflict was in its early stages, but the length of the conflict has made peace seem too distant to give the subject much serious thought.

Makers and dealers are apprehensive of the results on the industry and on business if all the military transports are sold at auction, as has been the custom with government disposition of surplus property. They fear that this will supply the demand that is likely to develop for several years, break prices and leave the business stagnated until the trucks have been disposed of and perhaps have been worn beyond usefulness.



Stripped Chassis of the Bevel Gear Driven Delivery Wagon Kissel-Kar Having a Load Capacity of 1000 Pounds.

They point out, also, that many of the military trucks will have received very hard usage and will not be in good condition. The wastage of horses has been so great that many business men who have never used trucks will be obliged to take them up, and that if their first experience with these second-hand trucks is unsatisfactory, it may be an additional setback to the industry.

One suggestion is that the government continue its army service corps and thoroughly overhaul and put in condition each truck before it is sold. This would ensure its operating well, would hold up prices to a certain extent, and if in addition the government spread the disposal of the trucks gradually over three years, it might not result in any great disruption of business.

Another suggestion is that all trucks of every make be turned back to the companies that made them to be rebuilt and disposed of as those concerns see fit. Germany is said to have already arranged for some system of disposal which is approved by the German motor manufacturers.

## GARFORD GOOD ROAD WORK.

### Sales Manager Williams Urges Industry to Promote Development.

With the approval of his associates in the Garford Motor Truck Company, S. M. Williams, sales manager, has engaged in a campaign during the past year of active agitation and systematic promotion of good road development and construction.

He has called attention to the interests of the city population which will be served by lower costs of produce resulting from good roads, shown the farmer how he will gain in the increased value of his land and the lower costs of hauling to market, and directed the attention of truck manufacturers and motor trade interests to the advantages they will secure from the development of good roads.

His company in backing the propaganda has been liberal in spending its money for advertising appropriations, booklets, questionnaires and trips which made it possible for Mr. Williams to address gatherings of the motor trade in various parts of the country.

A questionnaire was mailed to every automobile dealer in the United States, requesting information as to road conditions in each dealer's territory, and the influence of these highways on both the motor truck and passenger car business.

The replies received from 3440 legitimate dealers are astonishing in view of the small interest shown by the industry as a whole in the improvement of roads. The fact is that less than 10 per cent. of the public roads are in a condition which guarantee the economic or dependable use of the motor car or motor truck. This in itself should be enough to make every man connected with the trade roll up his sleeves and do his utmost to advance the good roads movement.

There is a tremendous opportunity for motor vehicles in the rural districts, but good roads are an essential before this market can be developed to the utmost. Mr. Williams has had long experience with good roads promotion and has made personal researches to obtain arguments which will advance the cause. One of his booklets on the subject has been distributed to the extent of hundreds of thousands of copies.

"Like selling any commodity with which people are unfamiliar, the success of the good roads movement depends upon educating the public as to its many advantages and showing them, how they, individually, will be benefited."

No more powerful influence in favor of good roads could be obtained, Mr. Williams believes, than with all the motor trade interests working as a unit to stimulate and promote improvement and construction.

More than a year ago he urged upon the industry the wisdom of educating those who have heretofore been opposing road improvement because they did not understand its importance to their interests. The in-

dustry through the National Automobile Chamber of Commerce decided against this action.

But with production capacity doubled or tripled, the visible demand for motor vehicles will soon be killed and it will then be necessary for the industry to increase or expand the market to insure the sale of the great number of vehicles it will produce.

A new and increased demand for motor cars and trucks will keep step with the progress of good roads in the country and the sooner manufacturers realize that it will require much effort on their part to make this improvement possible and take concerted action to help the movement, the sooner will these great new markets be available to absorb their products.

## CLUTCH IMPORTANT IN TRUCKS.

Discussing motor truck chassis, Russell Huff, until recently consulting engineer for the Packard Motor Car Company, emphasized the importance of the clutch. The several units for transferring power from the engine to the wheels are really a chain consisting of clutch, universal joints, gear box, propeller shaft, differential, driving axles and wheels. Like any chain, this is only as strong as its weakest link.

It is easy to calculate the necessary strength in all these units except the clutch. The brakes are expected to wear and be replaced, but the clutch is expected to stand harder usage without wearing. It must not only transmit the straight power of the motor, but it must endure a great deal of slipping when starting, for then the load is picked up gradually. The dry disc type with asbestos fabric lining Mr. Huff considers the most efficient.

## LIGHT TRUCK FOR \$465.

The Sheridan Commercial Car Company, with headquarters in Chicago and a factory at Harvey, Ill., has been organized to produce a new light motor delivery wagon to sell for \$465. It will be equipped with a 2¼ by four-inch, four-cylinder engine, block cast with removable cylinder heads. A Carter carburetor, Bosch magneto, a cone clutch and a thermo-syphon cooling system are features of the construction. The power transmission gearset has two forward speeds. A floating rear axle is used and the wheelbase is 104 inches. A windshield, horn, tools, Prest-O-Lite tank, headlights and a delivery body 43 inches wide and 55 inches long, with 8½-inch sideboards, are included in the equipment.

The Yellow Taxicab Company, which is operating on a new policy of 30 cents a mile with no public stands about hotels, is increasing its Chicago fleet rapidly and will soon have 600 cabs in operation. It has also large fleets in Kansas City and San Francisco. It assembles its own cars in its factory and has not been able to turn them out fast enough to take care of its business.

**SPRING LABORATORIES DESCRIBED.**

A handsomely printed booklet, describing and picturing the metallurgical laboratories of the Western Spring and Axle Company has been issued. It is the work of M. P. Gould Company, advertising agent, of New York City. The laboratories are as completely equipped as any in the industry in chemical, physical and microscopical departments. They are under the direction of Erwin C. Arndts, a metallurgist, who has specialized for years on motor car, and especially on spring, problems.

In the laboratories the company not only solves its own problems relating to material and methods of treatment, but it is always willing to co-operate with automobile engineers in working out special problems which they may wish to specially investigate. The results of research work are utilized for benefit of all constituent companies of Western Spring and Axle Company, which include: The Cleveland Axle Manufacturing Company, Canton, O.; Cleveland-Canton Spring Company, Canton, O.; Hess-Pontiac Spring and Axle Company, Cincinnati, O.; J. B. Armstrong Manufacturing Company, Flint, Mich.; Champ Spring Company, St. Louis, Mo.; Cincinnati & Hammond Spring Company, Cincinnati, O.; Spears Axle Company, Wheeling, W. Va., and Ansted Spring and Axle Company, Connersville, Ind.

**OMAHA DEALERS CHOOSE OFFICERS.**

The Omaha Automobile Show Association, Inc., has elected the following directors for the coming year: Clarke G. Powell, Guy L. Smith, J. T. Sewart, 2nd., George Reim and C. L. Gould. Of these directors the following were elected officers: J. T. Stewart, 2nd., president; Guy L. Smith, vice president, and Clark G. Powell, secretary and treasurer. Plans were made for Omaha's 11th annual automobile show, which will be held Feb. 21 to 26, inclusive.

**INTERSTATE TRUCK PRIVILEGE.**

A bill has been introduced into the Massachusetts legislature to permit trucks and motor cars owned within 15 miles of the state line in other states to take out a license for operation in Massachusetts during the year for a distance of 15 miles from the state line for \$15. This applies only to states that permit a similar privilege to citizens of Massachusetts. It is much favored by truck operators near the boundaries whose business in part is on the other side of the lines.

The fifth annual Wisconsin road school will begin its session Feb. 5 at Madison. The school is conducted by the state highway commission for the benefit of county road officials or any other residents of Wisconsin who are interested. A large exposition of road machinery is held in connection with it.

**MILLION DOLLAR VIM TRUCK FACTORY.**

So rapidly has the demand for Vim trucks increased that the Vim Motor Truck Company has begun the construction of a million dollar factory in Philadelphia, where next year 30,000 trucks will be produced.

The company already has three factories in Philadelphia which are working to capacity and these are to be continued. When it planned extensions the company determined to build on so large a scale that it would have the capacity to take care of its output for several years to come.

The new plant will be one of the finest in the country devoted to the building of trucks. It will be located at 23rd and Market streets, on the bank of the Schuylkill river. It will be six stories high and have floor space of 487,600 square feet. The exterior will be finished in white glazed tile with window frame in verde green. The interior will be extremely well lighted, as the windows take up most of the walls.

Modern factory architecture designed to produce the most efficient possible arrangement were consulted in drafting the plans. Each truck will be started on the top floor and will progress gradually downward as it is completed.

Vim cars previously have been tested on the road, but an elaborate system of electric dynameters will be installed in the new plant. Storage batteries will be used in connection with them so that the electricity which they create will be stored and turned into the factory lines for lighting and power purposes.

A spur track of the Pennsylvania railroad will enter the building, providing standing space for 28 freight cars about which loading platforms can be built. It is expected that the new building will be ready for occupation March 1, 1916.

Thirty thousand trucks will be produced during the next year according to present expectations. The Vim is a light truck, suitable for use by small business men.

**EXPORTS HELP JEFFERY COMPANY.**

The influence of export business in keeping factories going at full force in off seasons is shown by the statement of Charles T. Jeffery that this winter the Thomas B. Jeffery company's factory is doing twice the business it did a year ago, largely on passenger cars and trucks for export. The development of this business has made the company independent of seasons.

Fred Krauss, owner of the oldest harness store in Kansas, located at Topeka, has closed out his business, declaring that the popularity of the motor car had made it unprofitable.

Quakertown Borough, Pennsylvania, is planning to invest \$6000 in gasoline driven fire apparatus.



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# The MOTOR TRUCK

Devoted to Motor Driven Business Vehicles of all Classes

VOL. VII No. 2

February 1916

## Trucks at the Great Boston Show

LIMITED as to exhibits and exhibitors, despite the encroachment upon the space that has in previous years been devoted to displays of accessories, but occupying every available inch of floor area in department D, the motor truck division of the Boston automobile show, which will be opened March 4 and will continue until March 11, inclusive, will be the best and most comprehensive ever seen in Boston.

The exclusive power wagon exhibitions, held in Boston in 1912 and 1913, followed the automobile shows and were characteristic displays, although they were in the decoration created for the pleasure cars, and while these were larger than the department of the coming show that will be devoted to trucks, they were unlimited so far as space was concerned.

When the show will be opened there will be 33 different makes of machines displayed, and without doubt if there were space available this number would be increased at least 50 per cent.

In fact, there has been unprecedented demand for exhibition area for cars and trucks. For the first time a part of the balcony of Grand hall will be given over to machines, and Paul Revere hall will be wholly used for car exhibits, a condition never before experienced in the history of Boston shows.

The extreme business activity and the intense interest of all engaged in or having to do with highway transportation in motor trucks is such that a separate exhibition might have been justified this year, and there is probability that the manufacturers of power wagons will feel impelled to ask for exclusive shows for 1917, not only in Boston, but in New York and Chicago as well.

Boston automobile vehicle shows have always been national in proportions and scope, and they have always been productive of very large results from the viewpoints of the manufacturers and their representatives. For 14 years the exhibitions have been organized by the Boston



Grand Hall, Mechanics Building, Boston, as set for the First Exclusive Motor Truck Show in 1912.



Grand Hall, During the First Automobile Show Held in This Assembly Place, Directed by the Massachusetts Automobile Club in Connection with the Mechanics' Fair in 1902.

Automobile Dealers' Association, they have been managed by one individual and they have been held at a season of the year when buyers were attracted from all parts of New England, from Canada, and from some of the section from which the New York show would naturally be expected to draw its patronage.

The show will be in Mechanics' building, where all exhibitions have taken place since 1904, and there is every reason to believe that the display, which has become to be one of the institutions of New England, will have nation-wide attention. The Mechanics' building, which is the largest structure available for display purposes, having upwards of 105,000 square feet of floor space for exhibitors, has been outgrown, and for the coming show Manager Chester I. Campbell seriously considered renting another building to meet the demands made upon him.

Department D, in which the trucks will be exhibited, includes practically all of the basement, and Manager Campbell has departmentized this division so that all visitors will have an opportunity to make comparison—at least better opportunities than were the trucks located in different sections of the building.

The building will be handsomely decorated in modern renaissance, and statement is made that something like \$40,000 will be represented by the decorations, which will be quite as striking and original as those that have characterized the automobile shows of previous years. While these are not essential to the display or examination of trucks, they will undoubtedly be pleasing and interest-

ing to the visitors, and will be an attractive feature.

#### First Automobile Show in Boston.

The fact that automobile shows, in America at least, originated in Boston, may not be generally known, and the exhibition that will be inaugurated March 4 will be the 18th display that has been open to the public in that city. Not only this, there were two shows in Boston before similar display was made in New York.

For a long period of years a commercial and industrial exhibition, known as the Mechanics' Fair, was held each autumn in Mechanics' building, it being organized by the society that owns the structure, and generally continued for a month. This event attracted

people from all New England in large numbers. It was in connection with this fair in 1896 that two gasoline pleasure automobiles and a gasoline tricycle, all of them imported, were exhibited. They were shown with a large number of bicycles and were especially interesting to all riders.

#### First American Machines Shown.

Two years later, also in a department of the fair devoted to bicycles, were shown the first American automobiles seen in an exhibition in this country. By that time the people had become interested in horseless carriages and these machines came in for much attention. The first showing of automobiles made in New York City was at the bicycle exhibition in Madison Square Garden in 1899, and the first exclusive automobile show was organized by the Automobile Club



Symphony Hall, During the First Exhibition Held by Dealers, the Origin of the Boston Automobile Dealers' Association, Which Took Place in March, 1903.



The First Automobile Wagon of America, Built in 1895, by the Crutshank Engine Company, Providence R. I., from Designs by L. F. Baldwin, its Superintendent, for John Shepard, Jr., for Delivery Service of the Shepard Company's Department Store.

of America at that place in 1900.

A private show was held in Boston in 1901, this being at the first salesroom and garage, the Automobile Headquarters, which had been established in Stanhope street. The following year the Massachusetts Automobile Club, in connection with the Mechanics' Fair, organized a show that was of considerable importance with those who had become interested in automobiles because of the sport they afforded, this being similar in general features to those held in New York, and one of the particularly interesting events was the frequent demonstration of the machines on a track—possibly to convince the public that they were actually operative.

#### Organized the First Trade Show.

The automobile was in those days regarded as a mechanical plaything, and it was taken up as a business proposition very largely by those who were or had been engaged in selling bicycles, though there was no relationship between the two. In 1903 there was a sufficient number of motor vehicle dealers and such public interest in Boston that a proposition to organize a trade show met with considerable enthusiasm. Accordingly, at a meeting to consider the proposed exhibition 10 of the dealers each guaranteed \$100 toward meeting the expenses, and Symphony hall was engaged and a show was conducted with marked success.

Chester I. Campbell was secretary of the committee, and as such had the supervision of the preparations for and the conduct of the show, but the committee managed it. The men forming

the committee then organized the Boston Automobile Dealers' Association, of which Mr. Campbell was elected secretary, and in 1904 the second show was held in Grand hall in Mechanics' building, which was managed by him. At this show a number of motor boats were exhibited. The total attendance for the week was stated to be approximately 30,000. Since then all the shows have been managed by Mr. Campbell, who devotes his entire time to organizing and promoting them.

#### First Truck Show in 1907.

Not until 1907, however, was a freight carrying automobile seen in the Boston show. With 115 makes of pleasure cars and six of wagons and trucks, the exhibition was larger than any other in the country. That year there were 130 makes of cars and trucks shown at the two New York shows, and 96 makes were seen at Chicago. The previous shows had established Boston with the industry as being the one city of the country where business was absolutely certain in large volume, but the 1907 show demonstrated it to be exceptionally productive, both for the manufacturer and the selling representative.

Because of the pronounced business depression of 1907 and the consequent effect upon the industry, the number of exhibitors of cars and trucks in 1908 was 84, but this condition was even more pronounced throughout the country and was manifested at the New York and Chicago shows.

#### The World's Largest Show.

There was a decided gain in number of trucks and wagons in 1909, when 18 makers showed these vehicles, and for the first time trucks were departmentized. The next year the number of makes of trucks was 25 out of a total of 122 makes exhibited. In all 650 machines were shown and the exhibition was claimed to be the largest ever held in the world, this far exceeding the 597 shown at the Olympia show in London.



Two-Cylinder, 12-Horsepower Delivery Wagon Built by the Hotel and Railroad News Company, Boston, in 1898 to Meet Demand for Suburban Newspaper Distribution.



**The First Four-Cylinder Automobile Built in America. Designed and Constructed by Edward C. Schoize of Pawtucket, R. I. in 1897.**

Separate shows for trucks and wagons were held in 1911 in both New York and Chicago, but there was no change in the policy of the Boston association, and the show included 41 makes of trucks and wagons and 102 makes of pleasure cars. The attendance was 146,363. The Boston Commercial Motor Vehicle Association was formed and this took over the show in 1912, when 61 different makers exhibited, displaying 224 chassis and complete vehicles. The following year the show consisted of 219 chassis, stripped and fully equipped, representing 57 different makers. In 1914 the two associations combined their interests in a single show and that policy has continued since then.

## **NATION'S GREATEST MARKET.**

### **New England, with 7 Per Cent. of Its Population Has 20 Per Cent. of Its Trucks.**

New England has been a leader in launching the motor truck industry, just as it led the development of the pleasure car. The first power wagon designed and built for regular service was constructed in 1895 in Providence, R. I., for the Shepard Company, which operates a department store, after an express wagon, converted by the addition of a steam power plant and adapted for general purposes, had been found to be a failure, largely from lack of traction because of the use of steel tires.

New England has been noted for the men of mechanical genius whose example stimulated others to accomplishments, and the keenest competition impelled the adoption of economies so necessary to success. It was a Rhode Island man, George Brayton, who invented and operated the first successful internal combustion engine, which was practical and was not enormously profitable because the inventor was nearly a generation ahead of the time for recognition of the worth of his creation.

One of the causes for the rapid utilization of the motor truck by New Englanders is the fact that there are many commercial centres, close together, connected by highways on which animal transportation was largely carried on, and which, when trucks became practical vehicles, impelled their use because of the saving of time and labor. Long distance would have been discouraging, but the demands of the people for the building of roads and the improvement of those existing for the use of pleasure cars resulted in haulage undertakings that were found to be profitable and advantageous from many points of view.

### **Haulage Problems of Industry.**

One of the reasons for the early development of the section as a truck market was the fact that it contains many manufacturing plants which have haulage problems to which the truck is especially adapted. It has the best and most highly developed roads of any section of the country. It is so densely populated that towns are very close together and there is much intercourse between them of a kind that makes motor trucking practically a necessity.

New England is the leader of the development of the motor truck industry for many reasons, but chief among these is the fact that it has the largest ratio of trucks to population to be found anywhere in the world. This is substantial evidence that this is a section of the country that purchases and utilizes freight carrying vehicles more than any other, and a demonstration of the progressiveness of that class of men who has made New England industrially the bee hive of the nation.

Thus at the present time, when there are 100,000 trucks in use in all parts of the United States, New England, which contains a little less than seven per cent. of the population, has about one-fifth, or 20 per cent. of them. For many truck companies the Boston branch is the most important of all distributing establishments.



**The Knox Three-Wheeled Car, Built at Springfield, Mass., in 1899, Which Was Succeeded by a Four-Wheeled Type for Freightage.**





Electric Vehicle Truck, Built in 1904, Used by the Hartford Rubber Works Company of the United States Tire Company to Haul Tires from the Factory at Hartford to the Warehouse, a Haul That is "Across the Street"—Capacity, Five Tons.

There were registered in the various New England states at the close of 1915 the following commercial vehicles:

State	Trucks	State	Trucks
Maine	1,063	Massachusetts	11,960
New Hampshire	948*	Rhode Island	1,629
Vermont	358	Connecticut	4,846
Total			20,510

\*New Hampshire figures include also livery cars.

During the depression which immediately preceded the war there was scarcely a section of the country that was harder hit than New England and its manufacturing businesses. But when the war orders began to be placed, there was no section that got more of them and the result was that business revived there earlier and reached a higher point of expansion than in most other sections.

For months there has scarcely been a worker unemployed and all the mills, shops and factories are running at full speed, inability to get labor or materials being the only limitation upon their activity.

Delivery and hauling services had been generally curtailed or at least not expanded during the depression, but as soon as business revived trucks began to be bought in unprecedented numbers. Practically every truck of an established make that could be delivered was eagerly taken up by buyers.

Since the good roads movement began to succeed in creating good roads in various localities about the country, it has been found by many wide awake sales managers that the activities of the truck market bears a very direct relation to the condition of the roads.

There is no question but what

the famous roads of New England have a great deal to do with its prominence as a market for trucks. Even before the modern era New England's roads were better than those of most parts of the country and since highway improvement has become largely state activities in the hands of state road commissions, no states have done so much as those in New England to perfect their roads.

### Good Roads Are Common.

The result is that while only 10 per cent. of the public roads all over the United States are improved, in New England, 29.8 per cent. of the roads are surfaced.

The condition of the various states in this regard is shown in the following table:

State	Public Roads	Improved	Per Cent.
Maine	25,528	3264	12.8
New Hampshire	15,116	1025	16.8
Vermont	15,082	3278	22.7
Massachusetts	17,272	8928	51.7
Rhode Island	2,121	1246	58.8
Connecticut	12,582	3360	26.2

The population of the industrial districts is very dense and these excellent roads connect many towns which for the most part are only a very short distance apart. In such a state as Rhode Island there is hardly a neighborhood in the country, in the city, or in the small towns, where deliveries are not made by the department stores and markets of Providence. And on the north and east, where the regular store delivery limits of Providence end, those of Boston begin.

This long distance delivery is made possible by motor trucks. There is enough of it to make it pay. The result is that practically every New England department store has a great deal of haulage of this char-



Vehicle Equipment Co. Truck, Capacity 1000 Pounds, Built in 1902, Used for "Wheelbarrow Work" Between the Plants of Coes Wrench Company, Worcester, Mass.

acter and many of them have garages which are equal in equipment to those of the largest cities in other parts of the country, though the communities in which they are located may not be especially populous.

#### Much Interurban Trucking.

The proximity of the towns and the speed of truck hauling as compared with railroad shipment for short distances has caused the development of a great number of interurban express companies, that pick up freight in one town and distribute it in another, stopping, perhaps, at places along the route. Many of these operate on regular schedule. They take care of much of the transportation between city wholesalers and small town retailers.

The excellent roads make it possible and easy to move furniture and other loads for long distances by means of a truck. Because of the saving in expense of crating and packing the railroads have been losing more of this business every year.

The extent to which trucks are already being used in transportation in the industrial sections of New England is indicated by the fact that the government live stock report shows a marked falling off in the number of horses in the industrial section of New England during the last five years, while the business has been growing and population increasing. This can only mean that in spite of an increase in the number of horses on the farms, so many have been displaced in industrial hauling that the gain is more than overcome. This report shows a decrease of 1000 horses in each of the three leading industrial states during the past five years, Connecticut, Massachusetts and Rhode Island.

There is no general trolley freight service in New England such as is common in many parts of the Middle West. When the trolley was developing the railroads were able to confine it to local service. The result is that all of the freight hauling which does not go to the railroads is done by trucks.

The density of population on which these especially favorable conditions for motor trucking depends largely is shown by the fact that for the United States as a whole there are 30.9 persons to the square mile, while in the New England states there are 105.7 persons. According to the census bureau's estimate for Jan. 1, 1916, this population was divided as follows:

State	Population	State	Population
Maine .....	770,064	Massachusetts .....	3,690,748
New Hampshire.....	441,545	Rhode Island.....	608,540
Vermont .....	363,075	Connecticut .....	1,234,031
Total.....			7,108,003

In addition to the great use for motor trucks in distributive businesses in New England, there is also a great market in the manufacturing industry for hauling materials and finished goods.

With the exception only of the middle Atlantic states, New York, New Jersey and Pennsylvania, manufacturing is nowhere so highly developed as it is in New England. There were, when the Federal census

of 1908 was taken, 24,351 manufacturing establishments in New England, and they employed 1,101,290 wage earners, who turned out products valued at \$2,670,065,114, of which \$1,193,768,236 was value added by manufacture.

#### How Manufacturing Is Distributed.

The following summary shows the distribution of this business by states. There has been much growth since the census was taken nearly seven years ago and the war business has brought a period of remarkable expansion:

State	No. of Ind.	No. of Est.	Employees	Value of Product
Maine .....	126	3,546	79,955	\$176,029,393
New Hampshire..	104	1,961	78,658	164,581,019
Vermont .....	84	1,958	33,788	68,309,824
Massachusetts ...	223	11,684	584,559	1,490,529,386
Rhode Island.....	135	1,951	113,538	280,343,797
Connecticut .....	188	4,251	210,792	490,271,695

The value of the manufactured products of New England per capita amounted to \$480, while for the United States as a whole it amounted to only \$225. Similarly, the value added by manufacture in New England was \$182 per capita, as against \$93 for the country as a whole. Of the population 16.8 per cent. are industrial workers, as compared to 7.2 per cent. for the whole United States. New England produces 12½ per cent. of the country's manufactured products.

The different lines of manufacture which are prominent and the order of their importance in the various states are:

Maine: Paper, wood pulp, lumber, cotton and woolen goods, boots and shoes. Massachusetts: Boots and shoes, cotton and woolen goods, foundry and machine shop products, printing and publishing. New Hampshire: Boots and shoes, cotton and woolen goods, lumber, paper and wood pulp. Rhode Island: Woolen and cotton goods, jewelry, foundry and machine shop products, dyeing and finishing textiles. Vermont: Marble and stone work, lumber and timber, butter, cheese, condensed milk and dairy products, woolen goods and flour. Connecticut: Brass and bronze articles, foundry and machine shop products, cotton goods, silk and firearms.

#### First Trucks Built Here.

In the early days of the motor vehicle industry New England had a large part in it. In this section was built the first motor vehicle ever seen in public operation in the United States. The first sale of a motor vehicle was made in Boston. A New England man was first to equip a car with pneumatic tires. The first four-cylinder car was built in New England and in Providence, R. I., the first commercial motor vehicle of which there is any record was constructed.

This first truck was designed by L. F. N. Baldwin of Providence and built in one of the machine shops of the day, the Cruikshank Engine Company. The commission was undertaken on the order of John Shepard, Jr., who wished to use the vehicle in delivery service for the Shepard company's department store.



This vehicle was placed in service and was used for some time. Carburetion trouble developed, however, which could not be fully overcome and that led eventually to the abandonment of the vehicle. The motor was a two-cylinder, four-cycle unit. There were two inlet and two exhaust valves for each cylinder. Wheels were fitted with plain steel tires, which made it very difficult to get traction under some conditions. The carbureting device was contained in the inlet valves and ignition was of the hot tube type.

The Boston Hotel and Railroad News Company is another New England firm which did some pioneering in the truck field. For many years this company has had contract to distribute daily publications to the various newspaper dealers in the Boston district. In 1896 the section including Dedham, Hyde Park and the southwestern section of Boston could not be served in the time available for distribution. The service was as good as could be given with horses. But in an effort to better it the company decided to have an electric truck built in its own shops.

#### First Car Not Successful.

The vehicle was built, but because of the difficulty of getting the right sort of batteries and crudities in its design it was not successful. Then the gasoline motor was taken up. A wagon known to the company as No. 31 was built and put in operation. It was one of the first usable trucks constructed in the United States.

It had a Brennan double-opposed, 12-horsepower motor, which was not, however, sufficiently powerful to handle the heavy loads that were carried on the route. And there were other factors about it which prevented its perfect success. It included, however, many of the leading features of design of the trucks of today.

When its defects had become evident another truck was built with a 50-horsepower Trebert motor. This was known as No. 5 and was of the familiar modern type. This machine was successful and was used for a long time, but owing to the fact that its motor was over powerful for the rest of the vehicle, frequent breakages resulting in repairs, occurred.

But long before this early work was done in the commercial vehicle field, New England had been busy with the internal combustion motor, and with its application first to bicycles and then to the automobiles of the "buckboard" type, which were the first to develop.

In 1872 George Brayton invented an internal combustion engine and this was applied practically in a number of instances, for propelling a boat, for developing power for belt service, and an engine was placed in a street car and tried on the tracks of the Union Railroad Company in Providence. Because of the weight of the car and the consequent spreading of the extremely light rails, which were merely wrought iron caps on wooden stringers, the railroad company's of-

ficials decided that the use of the engine was impracticable. Were the cars equipped with these engines the tracks must be reconstructed, and this meant an impossible expense. Today the rails that would serve are used universally.

#### Engine's Practicability Established.

The practicability of the internal combustion engine was established, however, but the adaption of it to a road vehicle was patented by George B. Selden in 1879, and this patent was the basis of the famous litigation that was continued for years and finally resulted in the decision of the court that the patent was not a valid claim.

New England mechanics did a great deal in the development of engines for driving pleasure cars and the perfection of automobile design. Many of the pioneer builders were located in New England and much experimental work was done by them. In the early days of the industry a considerable number of firms built cars and some turned later on to trucks. With few exceptions these have ceased to exist, although some of them attained considerable proportions.

#### Some Factors of the Early Days.

Of these the Columbia Manufacturing Company, which later became the Electric Vehicle Company; the Pope Manufacturing Company, the American Locomotive Company, the Maxwell-Briscoe Motor Company, the Napier Company of America, the Grout Bros. Automobile Company, the Stevens-Duryea Company, the Cameron Motor Car Company, are some of the well known concerns that were more or less factors in the industry. The Locomobile Company of America, which first built steam vehicles and later turned to gasoline engines, and the Knox Automobile Company, which was succeeded by the Knox Motors Company, which were among the earliest to be established in New England, are today very widely known and produce machines that are recognized the world over for their quality.

There are other companies in New England that are well known, although they are not noted for quantity production as are some of the concerns having mammoth plants in the Middle West, but these are, as a rule, reputed for the character of the vehicles they build. To detail the growth of the industry in New England would be to tell the romance of automobiling in America, which would have no place in a story of the present utilization of power wagons for economic transportation.

Whatever part New England has had in the growth of the automobile vehicle industry has taught the people of these states that machines are practical. Figures show better than all else to what extent they are used, and there is the best of reason to believe that this market will continue to be the most productive of the world for the manufacturer and his representatives to exploit.

# BOSTON'S BIG NATIONAL MOTOR VEHICLE SHOW.

The Complete List of Exhibitors Presented Here Indicates that the Fourteenth Annual Display Will Be the Largest Ever Held in Mechanics' Building.

**T**HE doors of Mechanics building, Huntington avenue, Boston, will be thrown open to visitors early in the afternoon of Saturday, March 4, and except for the following Sunday, will remain open until Saturday evening of March 11, from 10 a. m. until 10:30 p. m.

This plan of hours was inaugurated last year to afford thousands of out of town motorists opportunity to attend and also to relieve the congestion that has been so noticeable at former exhibitions.

The exhibits have been well departmentized. The main floor will be given over generally to the display of pleasure cars, the basement to commercial vehicles and accessories, and the galleries of Grand, Machinery and Paul Revere halls to accessories exclusively. Many of the regular exhibitors will be found at the booths they occupied last year, which is a decided advantage both to the visitors and the dealers.

Following precedent, Wednesday, March 8, will be society and governor's day. On all days nationally known orchestras will entertain visitors with their music. The musical programme has been one of the chief features of Boston shows for years and this year the selections will prove no exception. It is expected that the Boston Philharmonic and the Laura L. Archambault woman's orchestras will be engaged for the week.

There has been a tremendous demand for reservations by manufacturers and dealers, and a large number have been, perforce, refused. The following tabulation shows spaces exhibitors will occupy:

## A.

- 145—Abbott Detroit Car, West Somerville, Mass.
- 444aa—Aerofram Co., Inc., The, 107 Massachusetts avenue, Boston.
- 549—Ahlberg Bearing Co., Chicago, Ill.
- 546—Albany Lubricating Co., New York City.
- 602aa—Allen & Daggett, Inc., 905 Old South Building, Boston.
- 137—Allen Car, 92 Massachusetts avenue, Boston.

- 429—American Express Co., Boston.
- 443—American Storage Battery Co., Cambridge, Mass.
- 32—Anthony, F. P., 1094 Commonwealth avenue, Boston.
- 132—Apperson Car, Boston.
- 354-355—Argo Sales Co., Inc., Boston.
- 100aa—Atlantic Auto Co., Boston.
- 501—Atwood Auto Lamp Co., Boston.
- 619—Atwood, J. H. & G. L., Boston.
- 427-428 Sp.—Auburn Car, 92 Massachusetts avenue, Boston.
- 408—Auto Parts Co., Boston.
- 319-320-323-324-336-337—Autocar Sales and Service Co., Boston.
- 303—Automatic Time Stamp Co., Boston.
- The Automobile Journal Publishing Company, Pawtucket R. I.
- 536-537—Automobile Legal Association, Boston.
- 514—Automobile Dealer and Repairer, New York City.

## B.

- 310-311-312—Baker Motor Sales Co., Inc., Cambridge, Mass.
- 304—Bay State Transportation Co., Fall River, Mass.
- 14 and 18—Beacon Motor Car Co., Boston.
- 100—Becker-Stutz Auto Co., Boston.
- 352-353—Bell Motor Sales Co., Boston.
- 413—Benn Pump Works, Inc., Boston.
- 400—Bird & Co., J. A. & W., Boston.
- 212-213—Bishop Motor Sales Co., Boston.
- 432 and 545—Boice-Perrine Co., Boston.
- 548—Boston Blacking Co., East Cambridge.
- 5 and 9—Bowman Co., The J. W., Boston.
- 301—Brietson Mfg. Co., Boston.
- 523—Brock Rubber Co., A. S., Boston.
- 532—Brooks-Skinner Co., Inc., Quincy, Mass.

- 604—Brown Spring Oiler Co., Cleveland, O.

- 111a-112—Briscoe Car, Boston.
- 140-144 inc.—Bulck Boston Co., Boston.
- 226—Bulck Trucks, 15 Lawton St., Boston.
- 441—Burd King Sales Co., Buffalo, N. Y.

## C.

- 135a-136—Carter, Fred C., Cambridge, Mass.
- 2—Cadillac Auto Co. of Boston, Boston.
- 540—Caldwell, John, Boston.
- 557—Campbell Co., A. S., Boston.
- 101—Canterbury, Inc., George W., Boston.
- 359-364 incl.—Cape Cod Power Dory Co., Wareham, Mass.
- 420—Central Auto Tire Co., Boston
- 108-109—Chalmers Motor Co. of Massachusetts, Boston.
- 434—Champlon Spark Plug Co., Toledo, O.
- 22 and 23—Chandler Motors of N. E., Inc., Boston.
- 111a-112—Charles Motor Co., 25 Irvington St., Boston.
- 3 and 132—Chase, Inc., M. F., Boston.
- 247—Chase Motor Truck Co., Syracuse, N. Y.
- 611—Cherry, Inc., A. C., 819 Boylston St., Boston.
- 121a-122—Chevrolet Motor Co. of N. E., Boston.
- 134aa—Class Journal Co., The, New York.
- 308-451-452-453—C o b u r n - D r a p e r

Motor Co., Boston.

36-37—Cole Motor Co. of Boston.

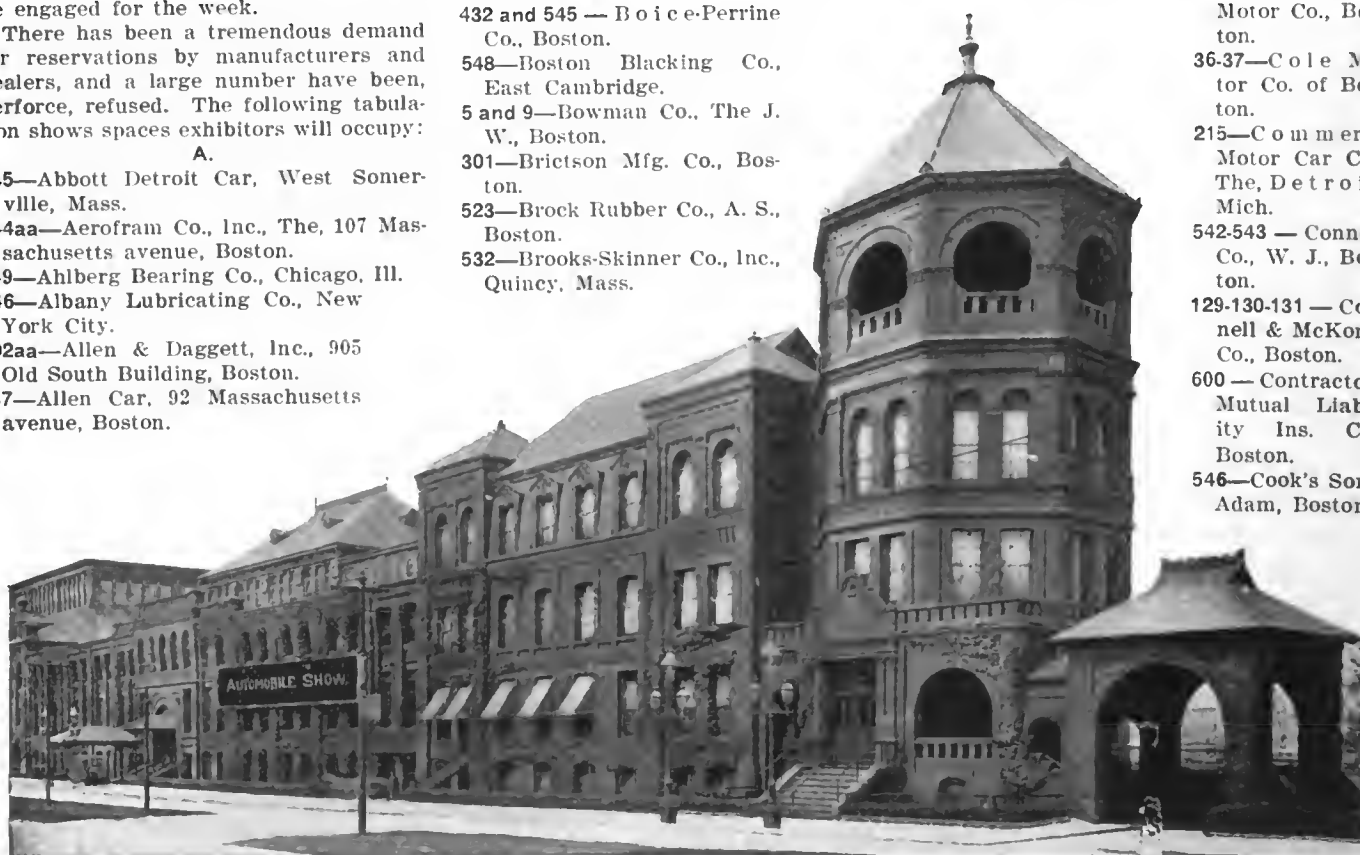
215—Commerce Motor Car Co., The, Detroit, Mich.

542-543—Connell Co., W. J., Boston.

129-130-131—Connell & McKone, Co., Boston.

600—Contractors Mutual Liability Ins. Co., Boston.

546—Cook's Sons, Adam, Boston.



Mechanics' Building, the Scene of the 14th Annual Boston Show, Which Is Expected to Break All Records.

331-334 incl.—Cotton, Inc., L. M., Boston.  
 520-521—Coward Auto Supply Co., Boston.  
 138 and 313—Cunningham Son & Co., Jas., Boston.  
 302—Cut Price Auto Supply Co., Boston.  
 358—Cygnet Rear Car Co., Buffalo, N. Y.

## D.

5 and 9—Daniels Car, Boston.  
 601—Davis-Watson Mfg. Co., Nashua, N. H.  
 524-525—Dayton Tire Co., The, Boston.  
 200—Denby Motor Truck Co., Detroit, Mich.  
 300—Detroit Auto Products Co., Detroit, Mich.  
 33—Detroit Electric, Boston.  
 424-425—Detroit Car, 911 Boylston St., Boston.  
 201—Diamond T. Motor Truck Co. of N. Y., New York City.  
 146-147—Dodge Bros. Car, Boston.  
 123-124—Donovan Motor Car Co., Boston.  
 411—Dorsey Mfg. Co., Boston.  
 115-116—Dort Car, Boston.  
 139 and 145—Dutton Motor Co., Inc., F. A., West Somerville, Mass.  
 530—Dyer Co., The G. H., Cambridge, Mass.  
 424-425—Detroit Car, Boston.

## E.

541—Eagle Oil and Supply Co., Boston.  
 526-527—Eastern Oil Tank Co., Lowell, Mass.  
 554—Eisner-Lenk Co., The, Boston.  
 139 and 145—Empire Car, West Somerville, Mass.  
 423a—Evans Carburetor Co., Inc., New York City.

## F.

113-114—Fiat Motor Sales Co., Boston.  
 511—Flentje, Ernst, Cambridge, Mass.  
 328-329a-620-621—Forbes, Walter J., Boston.  
 117-118—Ford Motor Co., Cambridge, Mass.  
 414—Ford Co., Percy, Boston.  
 217—Fostoria Light Car Co., Fostoria, O.  
 121b-127a-128—Franklin Motor Car Co., Boston.  
 505-506—Fryer-Auster Co., Providence, R. I.  
 513—Fuller Brush Co., The, Hartford, Conn.

## G.

219-220-221—Garford Truck, Boston.  
 317 and 321—General Vehicle Co., Inc., Long Island City, N. Y.  
 602—Gordon Tire and Rubber Co., Canton, O.  
 240-241—Grant Car, Boston.  
 507-508—Green & Swett, Boston.

## H.

305—Hardenbrook & Co., W. L., Boston.  
 544—Harding Manufacturing Co., Boston.  
 311aa—Harding, W. A., Boston.  
 401—Harnett-Smith Co., Boston.  
 26-27-28—Hart Co., A. T., Boston.  
 218—Harwood-Barley Mfg. Co., Marion, Ind.  
 38—Haynes Car, Boston.  
 338-345—Henderson Bros., North Cambridge, Mass.  
 125-126-127b—Henley-Kimball Co., The, Boston.  
 146-147—Henshaw Motor Co., Boston.  
 135a-136—Herff-Brooks Corporation, Indianapolis, Ind.  
 436—Hill Smith Metal Goods Co., Boston.  
 446—Hillman Auto Supply Co., Boston.  
 424-425—Hollmer Motor Sales Co., Boston.

502—Holt & Beebe Co., Boston.  
 603—Howe Rubber Co., New Brunswick, N. J.  
 125-126-127—Hudson Car, Boston.  
 100aa—Hupmobile Car, Boston.

## I.

222-223—International Harvester Co. of America, Somerville, Mass.  
 218—Indiana Truck, Marion, Ind.  
 111a-112—Interstate Car, Boston.

## J.

608—Jackson, Charles A., Boston.  
 35—Jackson Motor Car Co., Boston.  
 105-106-107-325—Jeffery Cars and Trucks, Boston.  
 601aa—Johnson Sporting Goods Co., Iver, 155 Washington St., Boston.  
 137—Judd, John L., Boston.  
 442—Justice Co., A. R., Philadelphia, Penn.

## K.

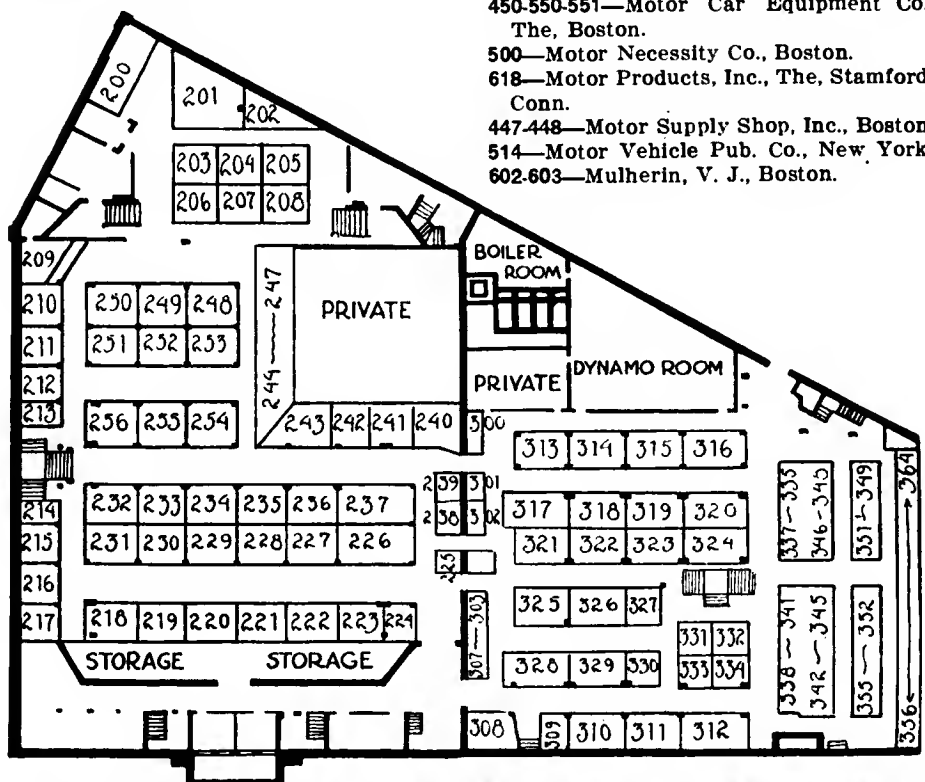
503 and 607—Keating & Decker, Newton, Mass.  
 556—Kelleher Co., J. J., Dorchester, Mass.  
 315 and 316—Kelly-Springfield Motor Truck Co., The, Boston.  
 613—Keys Piston Ring Co., St. Louis, Mo.  
 522—Keystone Lubricating Co., Boston.  
 134-135b—King Motor Car N. E. Agency, Boston.  
 34 and 104—KisselKar, N. E. Branch, Boston.  
 314—Knox Motors Associates, 32 Green St., Cambridge, Mass.  
 254-255-256—Kress & Son, O. F., Lawrence, Mass.

## L.

406—Lewi Clutch Control Co., Inc., The, Albany, N. Y.  
 119-120-235-236—Linscott Motor Co., Boston.  
 515-516—Linscott Supply Co., Boston.  
 237—Lippard-Stewart Motor Car Co., Buffalo, N. Y.  
 13 and 17-245-246—Locomobile Co. of America, Boston.

## M.

15 and 19—MacAlman, J. H., Boston.  
 243-244—Mack Motor Truck Co., 185 Massachusetts Ave., Cambridge, Mass.  
 329b-330—Maddocks Co., H. Ross, Boston.  
 307—Magnus, M. E., New York City.  
 16 and 20-248-253 inc.—Maguire Co., J. W., Boston.  
 423b—Malton Specialty Co., Inc., Boston.  
 614—Mann Co., F. W., Milford, Mass.  
 524-525—Marathon Tire Co., The, Boston.  
 8 and 12—Marmon Car, Boston.  
 133—Marion Car, Boston.  
 238-239—Martin Rocking Fifth Wheel Co., Springfield, Mass.  
 610—Marvel Mist Mfg. Co., Inc., Brooklyn, N. Y.  
 427-428 Sp.—Massachusetts Motor Sales Co., 92 Massachusetts Ave., Boston.  
 538-539—Massachusetts Mutual Auto Insurance Co., Boston.  
 403—Master Carburetor Sales Co., Boston.  
 308-451-452-453—Maxwell Car and Trucks, Boston.  
 32—McFarlan Six Cars, 1094 Commonwealth Ave., Boston.  
 500—Mead, J. Herbert, Boston.  
 318 and 322—Menominee Truck, Boston.  
 110-111b-242—Metz Company, Boston.  
 Table—Meyers Bros., Bronx, N. Y.  
 435—Miller, Charles E., Boston.  
 416-417—Mitchell & Smith, Inc., Boston.  
 354-355—Moline Knight Car, Boston.  
 Paul Revere Hall—Mitchell Car, Boston.  
 33—Milburn Electric, Boston.  
 202—Monahan Vehicle Co., The, Providence, R. I.  
 Table—Montello, V., Medford, Mass.  
 418—Moreton, Walter H., Boston.  
 102-103—Morse & Co., Alfred Cutler, Boston.  
 625—Motor Accessory Distributing Co., 86 Haverhill St., Boston.  
 624—Motor Accessories, Inc., 165 Massachusetts Ave., Boston.  
 450-550-551—Motor Car Equipment Co., The, Boston.  
 500—Motor Necessity Co., Boston.  
 618—Motor Products, Inc., The, Stamford, Conn.  
 447-448—Motor Supply Shop, Inc., Boston.  
 514—Motor Vehicle Pub. Co., New York.  
 602-603—Mulherin, V. J., Boston.



Layout of Display Spaces in Basement Where Commercial Cars Will Be Shown.

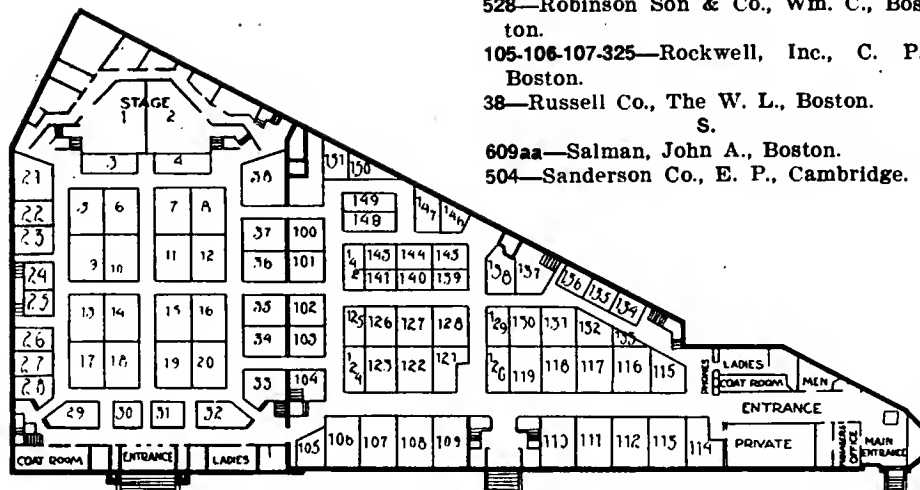


Diagram of Floor and Reservation Arrangement of Main Floor of Mechanics' Building.

- 615—Militaire Motor Vehicle Co. of America, Inc., Buffalo, N. Y.  
N.  
510—National Auto Assn., N. E. Department, Boston.  
26-27-28—National Car, Boston.  
412—National Oil Co., Boston.  
547—National Sportsman, Inc., Boston.  
210-211—Netco Trucks, Fitchburg, Mass.  
533—Newton, J. Edward, Fall River, Mass.  
555—Newton, Richard T., New York City.  
210-211—New England Truck Co., Fitchburg, Mass.  
440—New York Lubricating Oil Co., Boston.  
616—Northern Sales Co., Inc., 113 State St., Boston.  
226—Noyes-Buick Co., The, Boston.  
O.  
148-149—Oakland Motor Co. of N. E., Boston.  
4—Oldsmobile Co. of N. E., Boston.  
129-130-131—Overland Cars, Boston.  
3—Owen Magnetic Cars, Boston.  
P.  
1 and 203-208 inc.—Packard Motor Car Co. of Boston, Boston.  
24-25—Paige Motor Co. of Boston, Boston.  
14 and 18—Peerless Cars, Boston.  
150-151—Pathfinder Cars, Boston.  
531—Pettingell-Andrews Co., Boston.  
16 and 20—Pierce Arrow Cars, Boston.  
407—Planet Company, The, Westfield, Mass.  
518-519—Platt & Washburn Refining Co., Boston.  
Paul Revere Hall—Pope Hartford Co. of Boston, Boston.  
150-151—Porter Motor Sales Co., Boston.  
212-213—Premier Cars, Boston.  
449—Pressure Proof Piston Ring Co., Boston.  
402—Prismatic Lens Co. of N. E., Shelburne Falls, Mass.  
622—Pruden Co., The C. D., 39 Columbus Ave., Boston.  
421-422—Pullman Motor Car Co., York, Penn.  
R.  
552—Rand, H. L., Worcester, Mass.  
119-120-235-236—Reo Cars and Trucks, Boston.  
150-151—Regal Cars, Boston.  
623—Rellance A. C. Co., Inc., 2 Rector St., New York.  
102-103—Renault Cars, Boston.

- 528—Robinson Son & Co., Wm. C., Boston.  
105-106-107-325—Rockwell, Inc., C. P., Boston.  
38—Russell Co., The W. L., Boston.  
S.  
609aa—Salman, John A., Boston.  
504—Sanderson Co., E. P., Cambridge.

- 335 and 346-351 inc.—Studebaker Corp. of America, Boston.  
123-124—Studebaker Cars, Boston.  
T.  
219-220-221—Taylor Corporation, R. E., Boston.  
419—Texas Company, The, Boston.  
301—Tompson, N. W., 911 Boylston St., Boston.  
309—Tiffany Co., D. C., Boston.  
227-28—Touraine Co., The, Philadelphia, Penn.  
216—Transport Tractor Co., Inc., Long Island City, N. Y.  
353—Trumbull Cars, Boston.  
356-357—Turner Ring Co., Boston.  
563—Travers Co., Jas. A., Boston.  
605—Twin Rim Co., Boston.  
U.  
534-535—Underhay Oil Co., Boston.  
209—United Motor Truck Co., Grand Rapids, Mich.  
439—United States Rubber Co. of N. E., Boston.  
559—U-Sav-Your Mfg. Co., Warren, Mass.  
617—Utility Products Co., 814 Times Bldg., New York.  
V.  
518-519—Veedol Motor Oils, Boston.  
5 and 9—Velle Cars, Boston.  
318 and 322—Victor Motor Car Co., Boston.  
227-228—Vim Truck Co., Boston.  
W.  
240-241—Waite Co., H. S., Boston.  
562—Waldt, Ralph, New York City.  
309—Ward Electric Trucks, Boston.  
553—Webber Mfg. Co., Boston.  
115-116 and 133—Wentworth-Fosdick Co., Boston.  
326-327—Wentworth-Fosdick Co., Boston.  
214—West Steel Casting Co., The, Cleveland, O.  
433—Westinghouse Air Spring Co., Boston.  
212-213—Westcott Cars, Boston.  
560-561—Wetmore-Savage Co., Boston.  
7 and 11-254-255-256—White Co., The, Boston.  
229-234 inc.—White Co., The, Boston.  
129-130-131—Willys-Knight Car, 167 Massachusetts Ave., Boston.  
409-410—Wilson Co., John V., Boston.  
8 and 12—Wing, Frank E., Boston.  
6 and 10—Winton Co., The, Boston.  
529—Wonder Mist Co., The, Boston.  
404—Wright, John M., 27 Sherwin St., Waterville, Me.  
Y.  
224—Young Co., E. C., Randolph, Mass.

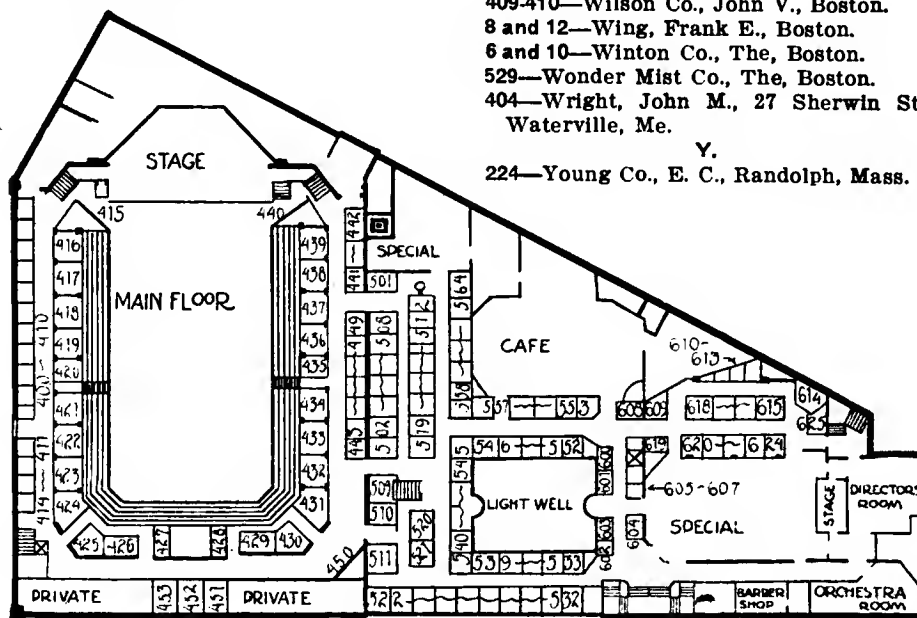


Diagram Plan of the Balcony Floor and Exhibition Booths.

## BUILDS BIG TUBE MILL.

### Timken Company Establishes Large Plant to Facilitate Bearing Production.

The Timken Roller Bearing Company, Canton, O., recently put into operation at a cost of \$500,000, a seamless steel tube plant wherein the steel tubing required for the Timken products is made. This is one of the most up-to-date tube mills in the country and is especially adapted to the production of high quality mechanical tubing.

The plant buildings are entirely of steel, of modern mill type, and have a maximum of daylight and ventilation. The piercing and rolling mills with their accessories are of the latest design and include a number of recently perfected and patented features which greatly improve the quality of the finished tubing.

The cold working department includes a pickle house annealing furnaces, pointers, draw benches, straighteners and cutting off machines. All of these are of heavy construction and of the latest design and practise.

The mill is already operating at full capacity 24 hours a day. The construction of the mill was undertaken because it gives the Timken company greater control over the quality of its product. The extensive processes required to produce tubes have always, even in slack times, made deliveries a matter of weeks, though steel billets can be had in days.

Since the war began there has been great difficulty in securing tubing for automobile requirements because of the shutting off of the foreign supply. There has been a great demand on the American tube mills and few of them are equipped to produce the high quality that is required for bearing work.

## ECONOMY OF MOTOR APPARATUS.

Operating expense of \$14.53 for the motor fire apparatus used by the city of St. Cloud, Minn., is reported by Chief L. A. Moosbrugge for 1915. The truck covered 113.6 miles running to fires and 10.03 miles in practise. Had horses been kept the expense, of course, would have been enormously greater. This illustrates strikingly the economy of motor apparatus in small cities where runs are not frequent. Interest on the investment in motor apparatus does not begin to equal the difference in the cost of upkeep and operation.

A hundred dealers and garage men have formed the Oregon State Automobile Dealers', Garage Men's and Repair Men's Association in Portland, Ore.

## MAKE PROFITS BOTH WAYS.

### Secretary Lane Says the Stronger Companies Control Gasoline Market.

In a report sent to the United States Senate regarding the causes for the high price of gasoline, Secretary of the Interior Lane stated:

"The obvious fact is that the producing and refining companies that are strongest in business foresight and financial backing take advantage both of the falling and rising markets in crude oil to strengthen an already strong position by purchasing both a stock of crude oil and additional producing properties. Under these conditions a market shortage of crude oil may be developed which is not wholly warranted by facts of actual production, yet it no less surely leads to higher prices in both crude and refined products. This furnishes the opportunity to the well supplied refiners



Fleet of Locomobile Worm Driven Trucks Now in Service "Somewhere" in France. Copyright, "The Commercial Motor," London, Eng.

to sell at the highest price, gasoline which is derived from crude oil purchased at a lower market price. The consumer who buys from a strong company, therefore, pays a price which is not determined by the price paid by the refiner for his crude oil.

"The smaller refiners, less favored with transportation and storage facilities and ready capital, may be so dependent for crude oil upon the current market that their cost of gasoline production is directly in relation to the current price of crude, if, indeed, they do not have to pay a premium whenever a shortage is feared. This advantage of larger profits to the stronger companies is perhaps inherent in the competitive system and must be recognized in any analysis of costs and prices."

The auto parts concern formed in Detroit by Joseph, Eugene and Leo Siegel, was mistakenly named in the January issue of the Motor Truck as the Detroit Auto Parts Products Company. The correct name is the Detroit Auto Products Company.



## BEATING GENERAL SHORTAGE.

### Building Deck Houses on Flat Cars to Ship Packard Trucks by Rail.

All the battles of life are not fought in the trenches and amid the showers of bursting shells or hails of machine gun bullets. There are others that are quite as exciting and as great in real achievement as those that are for "God and Country."

So far as the railroads of the United States are concerned, general shortage has controlled them all for months, and the undisputed possession of a real freight car is almost a novelty, even with those who have large dealings. Even so large a concern as the Packard Motor Car Company, with rail haulage at its disposal that would be sought by every railroad in normal conditions, has great difficulty to obtain cars of any kind. Box cars have ceased to be the fashion for shipping trucks from the Packard factory at Detroit, and any platform car is accepted with real gratitude.

When the "flats" are rounded up the trucks are driven from the factory under their own power and run up long skids on to the decks of the cars. They are located on special timber platforms and, with the wheels removed, are built into a stout shipping crate, of which the deck of the car forms the bottom.

The accompanying illustration shows a number of cars being loaded with trucks, there being a section of a train on either track. Loading the trucks and building the crates takes time and is expensive. Not only this, but the crates must be removed at the destination before the trucks can be taken from the cars. So insistent is the demand for machines that the carpenters crating them must work night and day, and the poles seen between the two lines of cars carries electric lamps. These were erected so that work need not be interrupted.



"Deckhouses" Built on Flat Cars in a Railroad Yard for the Shipment of Packard Trucks When No Freight Cars Were Obtainable.

## MOTORS INCREASE IN HONDURAS.

A year and a half ago there were no motor cars in Honduras, but now there are more than 30 and all are American machines. A number of them are trucks. Trucks are used to haul freight over the excellent road recently built from the Pacific port of Amalpa to Tegucigalpa, and the government is doing everything it can with its limited revenue to secure the construction of a road 150 miles long to other cities which would connect with the railroad. This road with trucks would reduce the time of mails, parcel post and light freight to about a week from New York as compared to from four weeks to two months at present. As it is 10 additional cars and trucks have been ordered and more will be purchased rapidly.

## URGES CO-OPERATION IN BUSINESS.

Edward N. Hurley, vice chairman of the Federal Trade Commission, speaking before the Rubber Club of America at the Waldorf hotel, New York City, Feb. 2, praised co-operation of business men in organizations like the rubber club. He said that business in America was suffering greatly through lack of proper accounting systems. This resulted in many businesses not knowing their costs and making their prices by guess. The result is that many things are sold below the cost of production. If a few firms do this, all must do it to get business, and the result is that disaster and trouble which good accounting would have avoided sweeps through an industry.

## ACCESSORY MAKERS JOIN.

The Motor and Accessory Manufacturers, Inc., at a meeting of its board of directors held Feb. 11, 1916, elected the following concerns to membership:

Blanchard Brothers & Lane, maker of patent and enamelled leather, 20 Bruen street, Newark, N. J.; Flint Varnish and Color Works, maker of paints and enamels for the automobile trade, Flint, Mich.; the Harrison Manufacturing Company, Inc., maker of automobile radiators, 101 Elm street, Lockport, N. Y.; Price Electric Devices Corporation, maker of lighting and ignition generators, Waynesboro, Va.; Syracuse Malleable Iron Works, castings, 101 North Geddes street, Syracuse, N. Y.; Walker-Weiss Axle Company, maker of automobile axles, Hamilton avenue, Flint, Mich.; the Driggs-Seabury Ordnance Company, automobile parts, 81 Sharpsville street, Sharon, Penn.



## TUNGSTEN PRICES SOAR.

### Its Use in War Munitions Causes an Accute Shortage.

Tungsten, which was first brought into use as filament in electric light bulbs, has become very much more generally useful during the past few years and is now an important material in the manufacture of automobiles.

Some of the remarkable qualities that this metal possesses are that it is insoluble in all of the common acids, its melting point is higher than that of any other metal, its tensile strength exceeds that of iron and nickel, it is paramagnetic, it can be drawn into smaller sizes than any other metal, and its specific gravity is 70 per cent. higher than that of lead.

Its greatest use in the manufacture of automobiles is in high speed steel from which the working parts of machine tools are made. Its hardness, and more particularly its property of maintaining that hardness when very hot, makes it possible to operate these tools with tungsten steel alloy cutters several times faster than carbon steel tools could be operated.

The metal is found in many parts of the world, but the principal source of supply is the United States. In 1907, when the demand for tungsten was just beginning to develop, 60 per cent. concentrates sold for \$840 a ton and today the price of the same ore is \$3000 a ton.

The metal is used much in shells and other war necessities and the shortage that has been caused is so acute that some factories are now saving the smallest bits of high speed steel to be remelted and used over again.

## NEW YORK OIL ASSOCIATION.

The New York Oil Trades Association was recently organized by some of the leading oil interests in New York City and held its first meeting Jan. 5 at the Whitehall club to adopt a certificate of incorporation and a set of by-laws. All details connected with the organization were completed at the meeting.

G. J. Rosen, an attorney, was instructed to file articles of incorporation. A committee on the formation of the new organization, consisting of J. M. Pigot of the Pigot-Sayre Company, Alpin I. Dunn of the N. B. Cook Oil Company and L. H. Atkinson of Fiske Brothers Refining Company form the membership of the committee, from whom information regarding the new association may be obtained.

## HAULING FRENCH ARMY GUNS.

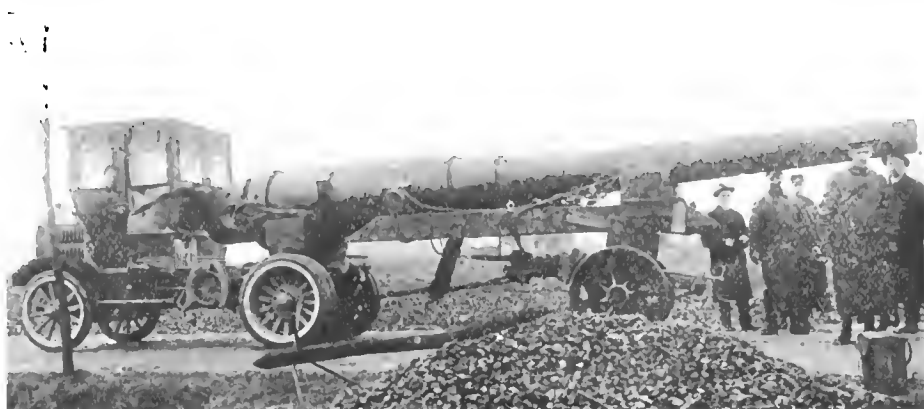
### How the Heavy Artillery is Transported by Tractors and Special Trailers.

No greater surprise than the mobility of the heavy artillery used by the warring armies of Europe has resulted from the continued hostilities. The highways of the states of eastern European states were exceptional when compared with the roads of America before the war, but the rapid transportation of large guns was believed to be impossible until there had been statements made in connection with battles that were undoubtedly authoritative.

Until after the opening conflicts there was supposition that what is known as field artillery was limited to pieces projecting shells of not exceeding four inches bore, but such belief was soon dispelled by knowledge that the guns used were of much larger caliber.

The accompanying illustration, which for obvious reasons was made "somewhere in France," shows a Knox tractor, a machine that has proven to be remarkably efficient for the haulage of heavy loads, hauling a gun that is 26 feet long and weighs 20 tons. The breech of the cannon is mounted for the purpose of transportation on the rear end of the frame of the tractor chassis, where it is supported by the rear axle and springs, and the chase or forward end is carried on a special trailer.

The distance of the trailer behind the tractor is maintained by a timber between the two and the cannon is securely lashed by chain. The gun is carried in wooden cradles and the forward end of the trailer is chained to the tractor chassis. The rigging is undoubtedly extemporized, but it has the merit of cheapness and strength. The tractor shown hauled the cannon over 11 miles of poor road in an hour and a half, which is not only a substantial evidence of the tractor's power and utility, but with the ordinary means 36 hours would have been required for this work. When time is as valuable as it is in battle the saving is significant.



Knox Tractor and Special Trailer Equipment Used by French Army to Transport a 26-Foot Cannon, Weighing 20 Tons—This Machine Hauled the Gun 11 Miles, Over Poor Roads in an Hour and a Half.

## TRUCK OVERLAND EXPRESS.

### Special Body Equipment for a Machine Freighting Between Maryland Cities.

Experience with any particular work and intimate knowledge of the conditions in which it is done develops ideas relative to facilities and equipment that would be most economical. Men who have such ideas are not always able to apply them logically, or so the best use may be made of the equipment, and they can often obtain good advice from those who have specialized construction to meet specific requirements rather than to attempt to work them out themselves.

One of the interesting types of bodies developed for motor trucks to serve in a general work has been built for the Hartford Transportation Company of Baltimore, Md., which operates a daily overland freight and express service between that city and Havre de Grace, having terminals in the two cities for receiving and delivering and collecting and delivering at all of the points through which the route passes.

The machine is a five-ton Saurer, and the body has a very large and low platform, with lower panels and rack sides, and a standing canopy. The top and the sides of the body are extended so as to form a cab for the driver, and the cab can be completely enclosed in the event of storms or cold, and it may be well ventilated when there is need. The sides of the body are curtained to protect the loads against rain or snow.

The body is made to unusual size that bulky, but light weight freights may be carried, because of the sides and the top, and the purpose is to carry capacity loads so far as possible. The machine is equipped with a large electric searchlight, so that it may be used at night with perfect safety. The company, besides greatly reducing the time that would be required by the railroad for transportation, also affords a tailboard delivery, which further decreases the expense of the customer.



Special Type of Body Built for Freightage on an Overland Express Route Between Baltimore and Havre de Grace, Md.

## DEALERS BUYING HEAVILY.

### Unprecedented Demand from Anxiety to Get Machines for Quick Delivery.

Practically every producer of motor vehicles for passenger or commercial purposes reports an unprecedented rush of orders received in January and February. This is undoubtedly due in part to more active buying by the public, which was very marked at the New York and Chicago shows.

But to a far greater extent it is due to the fact that dealers are frightened by the situation that is looming up before them for spring business. The reports of material and parts shortages, as well as the acute situation as to railway cars, convinces the dealers that they will have very little chance of securing delivery on machines that were not ordered early.

They learn that many of their competitors are already unable to get cars and they feel that if they have the vehicles on their floors they will be able to pick up business that would naturally go to some other dealer.

The result is that practically every dealer is placing orders for as many vehicles as he has capital to take care of or as his factory is willing to accept. This is permitting the factories to run at full production at a time when they are usually not busy and it is enabling the railroads to spread their heavy load over as long a time as possible.

It is an advantageous condition for the retail buyer, as it will enable him to get a truck which, if the dealers at this time were conservative and fearful of the future, he would not be able to buy later at any price.

## TAKE CARE OF FUTURE FINANCING.

Motor car and accessory stocks have been bought so readily by the public of late that some of the companies are preparing to take advantage of the favorable circumstances by issuing securities in a volume far beyond their present requirements to take care of future expansion.

Thus the stockholders of the Fisk Rubber Company, Chicopee Falls, Mass., are to be asked to authorize the issuance of \$5,000,000 additional common stock and \$5,000,000 second preferred. Recent issues made it possible to build large extensions to the plant, which will take care of the growth of the business for some time. Therefore, the new stock to be authorized may not be issued at once, but will be held in readiness for launching whenever the securities market is favorable.



**F**IVE sizes of trucks are built by the Krebs Commercial Car Company, Clyde, O., a concern that is operated by men who are exceedingly well known, some of whom have been identified with the motor vehicle industry since 1899, and who constructed machines for industrial purposes more than 10 years ago. The trucks are 1500, 2000, 3000, 4000 and 6000 pounds load capacities and are practically standardized to a single design, though there is a slight variance in some details of construction.

The company is well established, has a plant that is exceptionally equipped and has every facility for economical production, and the machines are built under a system that insured very accurate and careful work. The policy of the company was determined after investigation of the possibilities of the market. There was belief that a series of trucks of practically a single design, which would meet the requirements of at least 85 per cent. of those who have need for transportation equipment, would be a better business proposition than production of a single type, both for the company and the agents representing it.

The experience of the men composing the company with reference to the type of trucks that would be most saleable, dictated that these should be built to engineering principles that were known and understood by the great majority of those who might be regarded as probable buyers. By this it is meant that while there might be merit in adaptations that were new, these would not be approved until after substantial experience with them, and there was no desire to offer to the public anything that could not be guaranteed as efficient, reliable and enduring.

#### Designs Are Conventional.

The truck designs may be said to be conventional, the machines being constructed of units that are produced by some of the largest and best known manufacturers of the industry, whose products have been developed with extreme care and have been perfected by years of service and laboratory experience. The successes of the concerns manufacturing these components have been earned. They have specialized designs, materials and methods with the purpose of obtaining high efficiency and operating economy, and have been guided by the experience obtained in competitive service with the products of all others engaged in similar manufacturing. While initial cost has been a factor weighed by vehicle builders when all other qualities were equal, prices have not been established through the sacrifice of quality of material or workmanship.

To the contrary,

reputation has been obtained from operating results exceeding those that were guaranteed, and because of the perfections resultant from service and experience, the units as a whole may be said to be standard—standard in that they are known of all who have to do with motor vehicles as being thoroughly dependable and satisfactory from every point of view when used with ordinary care and attention.

#### Components That Are Known.

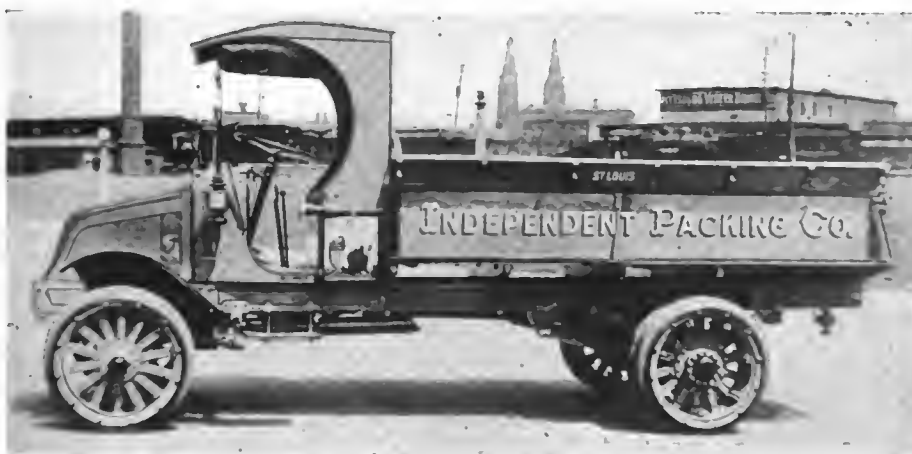
The Krebs trucks are equipped with Continental engines, made by the largest manufacturer of automobile engines in the world; with Brown-Lipe transmission gearsets, and with Timken-David Brown rear axles and Timken front axles, and throughout the machines are fitted with Timken roller bearings. All the parts are designed for heavy service and there are very large factors of safety with all of them. Very careful provision is made for lubricating all of the moving contacting parts, and so far as possible all of the members are enclosed to protect them against abrasion and excessive wear. Simplicity and accessibility were sought by the designer with a view of minimizing the labor and attention necessary for maintenance. Wherever practical bushing has been done, so that in many instances renewal of these will afford complete restoration instead of the use of new parts, a saving that will be considerable during the life of a truck. There are also means for the very close adjustment of the points that are pivoted or secured by yokes or pins to compensate for wear.

#### How the Chassis Differ.

The wheelbase of the 1500-pound truck is 120 inches, of the 2000-pound truck 120 and 144 inches and of the 4000-pound and 6000-pound trucks 144 and 162 inches. The principal differences in the chassis are that the engine of the 1500-pound truck is cooled by a thermo-syphon circulation of water and those of the three larger sizes are cooled by pump circulation; the engines of the 1500 and the 2000-pound trucks are 3¼ inches cylinder bore and five and 5¼ inches stroke respectively, while those of the 4000 and the 6000-pound trucks are 4¼ inches cylinder bore and 5¼ inches stroke. The 1500 and 2000-pound trucks have three forward speed ratio gear-

sets and the 4000 and the 6000-pound trucks have four forward speed ratio gearsets. The brakes of the 1500, 4000 and 6000-pound trucks are all internal expanding, while those of the 2000-pound trucks are external contracting and internal expanding.

All of the trucks are driven by worm shaft and gear wheel, and by straight shafts extending from the transmission gearsets to the rear



Three-Ton Worm Driven Krebs Truck Equipped with a Standard Type of Express Body with Wide Flareboards.

axes. The engines and clutches are units that are mounted on three points, with the gearsets suspended in the frames close to the engines, but independent from them. The radiators are installed behind the engines, this following the Renault design, the radiators and dashes being combined, and the fans are carried at the rear of the cylinder blocks. The radiators are so located because they are better protected and cannot be damaged by accidents that might happen were they carried at the forward end of the chassis frames.

#### Drive Through the Rear Springs.

The rear spring suspension is what is known as the Hotchkiss drive, the traction thrust and braking stresses being sustained by the forward ends of the springs, the springs being shackled at the rear and pivoted in heavy hangers at the forward end. This construction is conventional in Europe and has been adopted by a considerable number of American truck manufacturers as being more satisfactory than the use of radius rods. One of the substantial reasons for its adoption is the fact that there is never need of adjustments such as are necessary with radius rods, and another is the greater simplicity.

#### Three Sizes of Continental Engines.

The engines of the 1500-pound trucks are Continental model N, but those of the 2000, 4000 and 6000-pound trucks are Continental model C. In design the engines differ somewhat, generally in dimensions, for the materials and the methods of building are practically alike. Because of the similarity one description will serve for all, with statement showing wherein they differ.

All the engines are vertical, four-cylinder, water cooled, four-cycle, L head types, and the cylinders are cast en bloc with the water jackets integral. With cylinder bore of  $3\frac{3}{4}$  inches and stroke of five inches the model N engine is rated at 22.5 horsepower by the S. A. E. formula, but the maker claims that it will develop 23 horsepower at approximately 1000 revolutions and about 34 horsepower at 2000 revolutions. The same rating obtains for the Continental model C engine with bore of  $3\frac{3}{4}$  inches and stroke of  $5\frac{1}{4}$  inches, but because of the somewhat longer stroke the power of the model C engine will at least equal that of the model N, although operated at slower speeds. The horse power rating of the model C engines having bore of  $4\frac{1}{8}$  inches and stroke of  $5\frac{1}{4}$  inches is 27.20, and that these engines will develop approximately 40 horsepower at 1500 revolutions is claimed by the manufacturer.

All of the engine blocks are cast with a special gray iron



Two-Ton Worm Driven Krebs Chassis with Combination Hose and Chemical Equipment for Fire Department Service.

that has unusual qualities of endurance. The water jackets are integral with the blocks and the castings are made with the water jackets practically open above the combustion chambers. The jackets are closed with large plates that carry the outlet manifolds and these are secured by series of cap

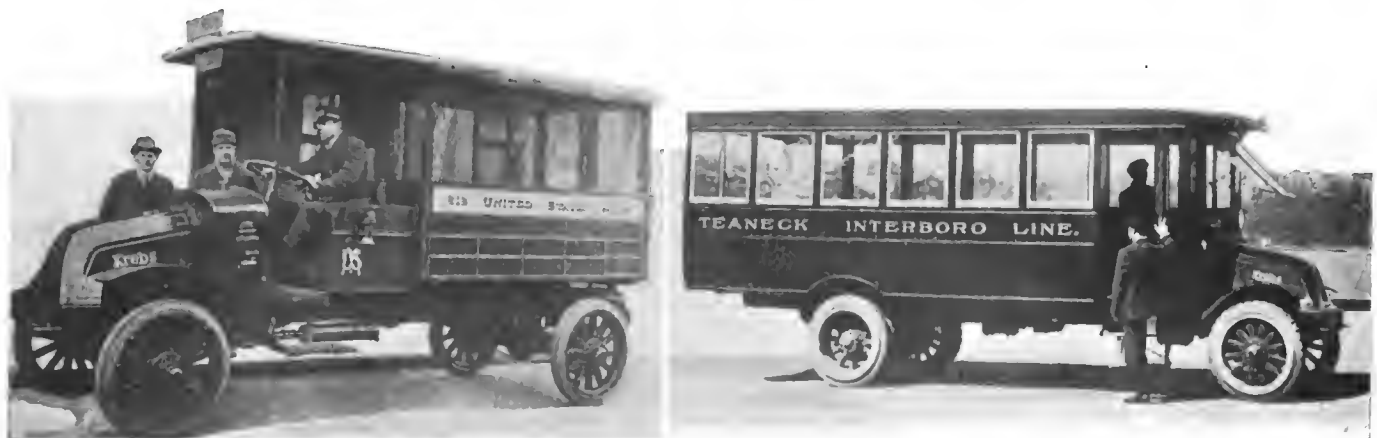
screws. The designs insure the cooling of the cylinder heads and the water passages are thoroughly cleared to obtain free circulation of the water. With the model N engine the water outlet manifold is somewhat larger in proportion than are those of the model C engines. The valves are at the right side of the model N engines and at the left side of the model C engines.

The base flanges of the engines are heavy and there are webs at the centre and at the ends of each casting beneath the valve pockets that form seats for the covers of the valve mechanisms. After the blocks are tested by water pressure for leaks of the cylinders or jackets they are rough bored. They are then aged to insure against distortion due to machining stresses. Next they are reamed and ground to the standard dimensions and are again subjected to water pressure tests.

#### Pistons and Crank Cases.

The pistons are cast from the same material as the cylinder blocks, those of model N engines being  $3\frac{3}{4}$  inches length and those of the model C engines being five inches length. After the pistons are turned they are ground to exact size, this affording a very accurate finish. All pistons are cut for oil grooves and channelled for three  $3/16$ -inch diagonally split eccentric expansion rings. The rings are subjected to a special machine process to relieve expansion stresses and they are ground on the faces and sides to precise dimensions to insure complete compression in the cylinders. By boring them on special machines accuracy of the wristpin holes for diameters and alignment is obtained. All pistons are weighed and accurately balanced by careful tests.

The crank cases are in two sections. The upper sections are cast from an aluminum alloy with vertical transverse webs to carry the centre main bearings, with pockets formed in the walls to collect lubricant for the camshaft bearings. The lower section of the crank case of the model N engine is formed of pressed steel, which is extremely light and very strong. The lower sections of the crank cases of the model C engines are aluminum alloy. In the lower sections are the troughs into which the connecting rods sweep. Extensions at the forward ends of the sections form the housings for the timing gearsets. The lower sections of the crank cases may



Krebs Two-Ton Chassis with Special Bodies: At Left, a Covered Express Body with Screen for Carrying Mail; at Right, a Public Service Omnibus in Use in a New Jersey Town.





Krebs 1500-Pound Chassis with a Covered Body Designed for the Delivery Service of a Baker.

be readily removed without taking the engine from the chassis for work on or examination of the main and connecting rod bearings.

#### Crankshafts and Connecting Rods.

The crankshafts are three-bearing types, drop forged from special alloy steel with the flywheel flange and a flange at either side of the centre main bearing integral. The flanges at the centre main bearing are intended to sustain end thrust from the clutch or any other cause. The crankshaft of the model N engine is  $2\frac{3}{16}$ ,  $2\frac{7}{32}$  and  $2\frac{1}{4}$  inches diameter at the front, centre and rear main bearings, and the bearings are in the same order  $2\frac{7}{8}$ ,  $2\frac{1}{2}$  and three inches length, a total of  $8\frac{3}{8}$  inches. The crankshafts of the model C engines are  $1\frac{7}{8}$  inches diameter, and the bearings are respectively  $2\frac{9}{16}$ , three and  $3\frac{13}{16}$  inches length, having a total bearing length of  $9\frac{3}{8}$  inches. The crankshafts are heat treated and ground to exact size. They have a tensile strength of 90,000 pounds to the square inch.

The I section connecting rods are drop forged from .35 carbon steel. Perfect accuracy of centres are obtained by boring and reaming the bearing ends on special machines, and strength is afforded by heat treatment. The caps that secure the bearings in the big ends are retained by four nickel steel bolts and locked nuts. Special steel tubing is used for the wristpins, which are hardened and ground to size. The wristpins are fixed in the bosses of the pistons by locked cap screws and the small ends of the connecting rods, which oscillate on the wristpins, are bushed with phosphor bronze.

#### Camshafts with Integral Cams.

The camshafts are drop forged, with the cams integral from low carbon steel, and after they are turned and the cams have been rough machined, they are annealed and heat treated. They are then finish-ground on special machines that insure the accuracy of the contour of the cams. The camshaft of the model N engines is  $1\frac{1}{4}$  inches diameter, the diameter of the bearings are from front to rear  $2\frac{19}{32}$ ,  $2\frac{5}{8}$  and  $1\frac{1}{4}$  inches, and the lengths in the same order are  $1\frac{1}{2}$ ,  $1\frac{1}{8}$  and  $1\frac{3}{8}$  inches. The camshaft of the model C engines is  $1\frac{1}{16}$  inches diameter, the diameters of the bearings from front to rear are  $2\frac{1}{4}$  and  $1\frac{7}{8}$  inches, and the lengths in the same order are  $2\frac{9}{16}$ ,  $1\frac{1}{2}$  and  $1\frac{1}{4}$  inches.

#### High-Grade Bearings.

High-grade nickel babbitt metal is used for the crankshaft, camshaft and the big ends of the connecting rods, and the crankshaft and connecting rod bearings are mounted in bronze cages in which they are retained by brass screws. Steel shims are fitted to the connecting rod bearings for adjustments when worn. Much care is taken in fitting the bearings, which are expanded, reamed and burnished.

The timing gearset is composed of a crankshaft, a camshaft, a water pump and an idler gear. The gears are made with wide faces and are cut helically to insure operation without noise. Accuracy of the gear centres is obtained by

careful methods. By removing the cover of the housing the gearset can be readily reached.

#### The Valve Mechanism.

The valves are made with nickel steel heads electrically welded to carbon steel stems and the ends of the stems are hardened to resist wear from the tappets. The valves, which are interchangeable, are mounted in long guides seated in the cylinder blocks. The valve ports of the model N engine are  $1\frac{11}{16}$  inches diameter and of the model C engines two inches diameter. The clearance of the valves makes for complete exhausting and inhauling and high engine efficiency. Mushroom type valve tappets are mounted in removable guides seated in bosses in the base flanges, and these are fitted with adjusting screws and lock nuts. Special locking devices retain the oil tempered springs that actuate the valves. The valve chambers are covered with two steel plates retained by thumb nuts that are easily removable.

#### Cooling and Lubricating Systems.

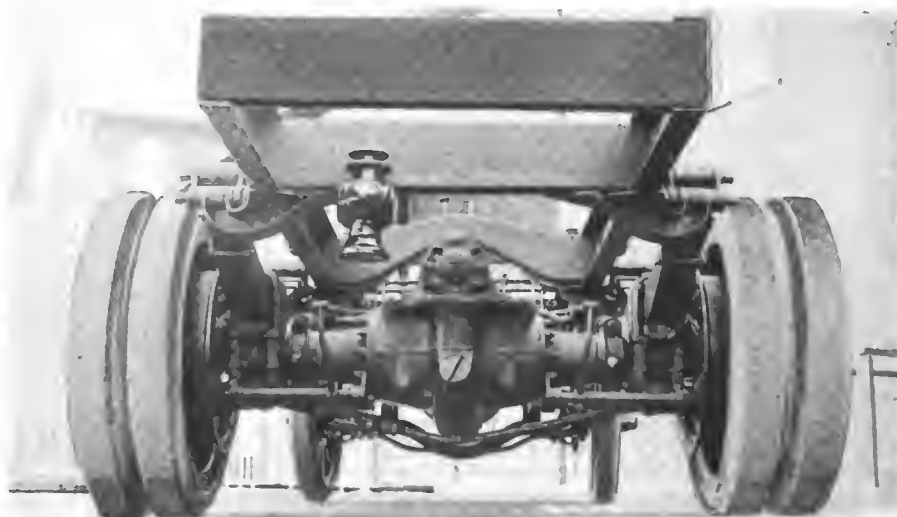
The engines are cooled by water, the model N by thermosiphon circulation through the cylinder jackets and the large vertical tube radiator and by a fan mounted on a ball bearing in an adjustable bracket on the rear of the cylinder block that is driven by a flat belt from an extension of the outside shaft that drives the magneto; the model C's by circulation forced by centrifugal pumps with extra large bearings and stuffing boxes through the jackets and vertical tube radiators. The fans are similarly mounted and are driven by flat belts from extensions of the outside shafts that drive the water pumps and the magnetos.

The lubrication system of the engines is identical, a combination of force feed and splash. The oil is drawn from a well in the base of the crank chamber that is surrounded by a filter screen, by a plunger pump that is driven by eccentrics on the camshaft. The oil is forced through tube to the rear main bearing and the timing gearset, flooding them. The oil drains to the troughs in the base of the crank chamber and is distributed by splash to the cylinder and piston walls, the centre main bearing, the connecting rods, cams and the valve tappets. The camshaft bearings are lubricated by pockets in the crank case walls that are filled by splash and the wristpins are oiled by lubricant trapped at the heads of the pistons.

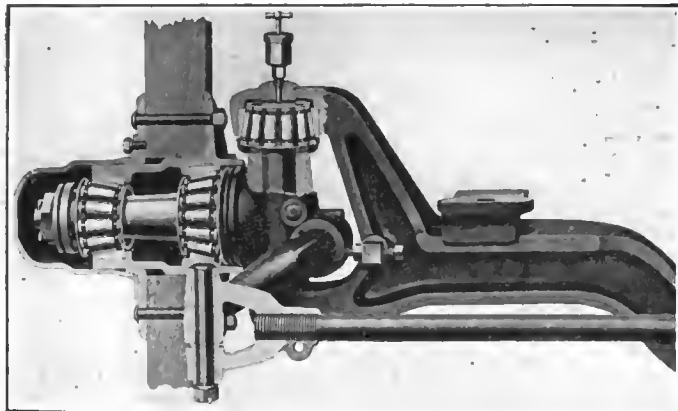
#### The Krebs Automatic Governor.

The carburetors are an automatic float feed type that are said to be very efficient at all engine speeds, and the ignition current is supplied by Bosch high-tension magnetos. All engines are equipped with the Krebs automatic governor, which is maintained to be the only instrument of the kind that absolutely controls the engine at all speeds. The governor is located at the front of the engine and it adjusts the time of the ignition to meet every change in the working condition of the motor. With the Krebs governor the driver has no control of the engine except through the governor. He simply sets the speed lever at the mark he wishes to make and the engine is automatically controlled.

By this is meant that the governor will open the throttle



Rear View of Krebs Three-Ton Chassis, Showing the Timken-David Brown Worm Shaft and Gear Axle, Used in All Types.



Timken Front Axle with Wheel Spindle and Knuckle Fitted with Timken Roller Bearings.

as wide as is necessary to maintain a given speed on a steep ascent, for instance, and when a level road is reached the governor closes the throttle. It will have similar control if the clutch is disengaged. Though the engine is started with the throttle open, it is never raced, for the governor will close the throttle when a moderate speed is attained, but the full power of the engine is available to bring the truck to the maximum speed for which the governor is adjusted. The claim is made that other types of governors cannot be used for both high and low speeds because one spring that is stiff enough for high speeds is too stiff for low speeds. In the Krebs governor one spring is adapted for all speeds by changing its relation to the other parts of the governor.

#### The Operation of the Governor.

The operation of the governor is illustrated by drawings, the first showing the instrument set for high speed, the second for low speed, and the third the governor's variability. With reference to these the lever A controls the throttle and when it is in the position shown at C the throttle is closed, and when in that shown at O the throttle is open. The centrifugal force of the weights acting on a lever inside the governor case tends to close the throttle, but the force exerted is balanced by the pull of the spring. When the speed lever B is in the low speed position, shown in the second sketch, the spring is so close to the pivot on which the lever A oscillates that it has the effect of a very flexible spring, and in moving the throttle from the open to the closed position the spring is stretched much more than when in the high speed position shown in the first sketch. Because of this the comparatively slight centrifugal force, due to the high velocity of the rotating weights, is sufficient to operate the throttle over its entire range, from the open to the closed position. Were the spring pulling in the same direction as in the first sketch the centrifugal force would move the lever but very little.

#### Maintains Correct Automatic Control.

Claim is further made that besides controlling the throttle the Krebs governor maintains the only correct automatic spark control. When the engine is running with full load, that is, with the throttle open, a large volume of gas is drawn into the cylinders and diluted with the comparatively small volume of burned gas remaining in the combustion chamber, and it is then highly compressed, forming a dense, quick burning mixture. When the engine is running with a light load, that is, with the throttle nearly closed, but a small volume of fresh gas is admitted, which is diluted with a comparatively large volume of burned gas and only slightly compressed, forming a slow burning mixture.

That the maximum pressure shall occur at the most advantageous point in the engine stroke the gas should be ignited earlier when the throttle is nearly closed than is necessary when the throttle is open, and for this reason the spark should be advanced as the throttle is closed. The Krebs governor is connected with the magneto so that the spark is advanced as the throttle is closed. By reference to the illustrations of the governor's action one will note that the lever B is moved toward the left as the speed is increased and the upper arm of the lever A moves toward the left as the throttle is closed. These levers are connected by rods to the ends of the timing lever L, which in turn is pivoted at its centre to the upper arm of the bell crank lever M. The horizontal

arm of M actuates the circuit breaker of the magneto, advancing the spark as the lever moves downward.

#### Maximum Advance When Needed.

The maximum advance occurs only when the truck is being driven at high speed with a full load, as shown by the full lines in the first sketch. When a grade is being ascended, so that the full power of the engine is necessary, the governor opens the throttle and retards the spark to the position shown by the dotted lines of the first illustration. When being driven with a light load the spark is partly advanced, which position is represented by the full lines of the second illustration, but as the load increases the spark is further retarded, as is shown by the dotted lines of the second illustration. This action is further illustrated at the third sketch.

The claim is made that other automatic timing devices that adjust the spark position with reference to speed are not influenced by the changes in the load upon the engine. As the average truck driver is seldom an expert the spark lever is not often set at the position where the greatest power is realized. For this reason the fixed spark is sometimes adopted by manufacturers.

The Krebs governor is controlled exclusively by the Krebs Commercial Car Company and is only used as equipment for the machines that this concern produces. By this the speed of the 1500-pound truck is limited to 20 miles an hour, the 2000 and the 4000-pound trucks to 15 miles, and the 6000-pound truck to 13 miles.

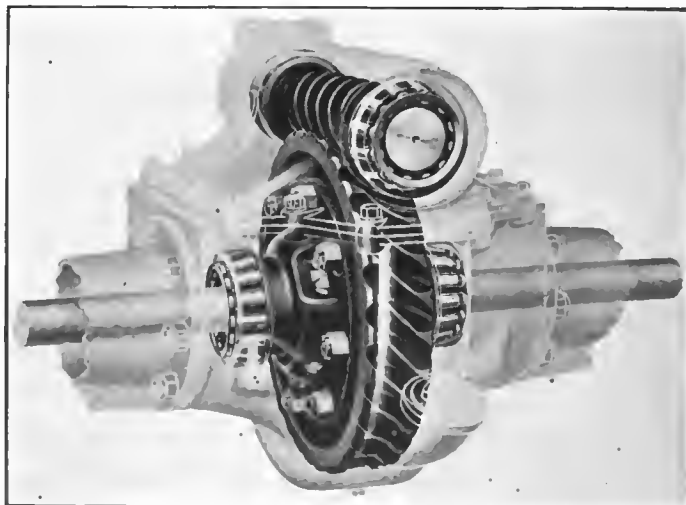
#### The Power Transmission System.

The clutch for all the trucks is a standard type of cone, leather faced, with adjustable springs beneath the facing, by which easy engagement is assured. The clutch is stated to be extremely efficient. That of the 1500-pound truck is 14 inches diameter and those of the other machines 16 inches diameter. There is a universal joint between the clutch and the transmission gearset. The power plant is suspended from three points, by a trunnion that is mounted in a yoke that is arched across the chassis frame at the forward end the motor, the trunnion of the yoke being seated in an eye in the extension of the engine case, and at the sides upon arms cast integral with the engine crank case that are bolted to the side members of the chassis frame. The clutch may be removed without dismantling the engine or the transmission gearset.

The gearset case is supported by four arms, two at either side, directly in the rear of the clutch, the case being an extremely substantial aluminum alloy casting. It is directly under the footboard and may be removed by taking out four bolts and removing two universal joints. The shafts are nickel steel and the gears are the same metal, 6-8 pitch, and  $\frac{7}{8}$ -inch face in the 1500-pound trucks and one-inch face in the other three machines. All the shafts are mounted on Timken roller bearings.

#### Timken-David Brown Rear Axles.

The drive is direct from the gearset to the worm shafts of the Timken rear axles by large tubular shafts with universal joints at either end. These universal joints are so con-



Phantom View of the Worm Shaft and Gear of the Timken-David Brown Rear Axle, Mounted on Roller Bearings.





The Continental Engine of a Krebs Chassis, Showing the Automatic Governor at the Left Side of the Cylinder Block.

structed that they may be taken down by removing six bolts, a work that can be done quickly. The size of the shafts prevents "whipping." The Timken-David Brown axles are full-floating types, the housings being made with central sections to which the two end sections are bolted. The tops of the central sections are open and these are covered with large plates, on the top of which the worm shafts and bearings are mounted, and to which the frames or spiders that carry the worm gears and the bevel gear differential gearsets, carried on Timken roller bearings, are bolted. These assemblies are adjusted at the factory and may be removed as units by taking out the bolts retaining the cover plates.

The end sections of the housings carry the spring seats and the flanges that support the brake shafts, and they are reinforced by steel tube that extends practically the entire length, the outboard ends serving as sleeves on which are mounted the Timken roller bearings on which the wheels turn. The shafts of the axles are forged with the clutch plates integral and these fit the hubs of the wheels. The axles are trussed to the better endure the strains upon them.

#### Front Axles and Wheels.

The front axles are Timken made, being 1 section steel drop forgings that are equipped with heavy steering knuckles. The heads of the steering knuckle pivots and the wheel splines are fitted with Timken roller bearings. The tie rods and the drag links are placed behind the axles to protect them against damage by striking road obstructions. The wheels are wood, artillery type, those of the 1500-pound truck having oval spokes and those of the other three trucks having square spokes. The wheels of the 1500-pound truck are fitted with 34 by 4½-inch pneumatic tires, both forward and rear; the 2000-pound truck wheels are equipped with 34 by 3½-inch solid tires forward and 34 by four-inch solid tires rear; the 4000-pound truck is shod with 36 by four-inch tires forward and 36 by six-inch tires rear, both being solid bands, and the

6000-pound truck has 36 by five-inch tires forward and 36 by five-inch dual tires rear.

The frames are pressed steel channel sections, that of the 1500-pound truck being 4½ inches wide with two-inch webs, of 5/32-inch material; that of the 2000-pound truck is five inches wide, with two-inch webs, of 3/16-inch material; that of the 4000-pound truck is six inches wide, with two-inch webs, of 7/32-inch material, and that of the 6000-pound truck is seven inches wide, with 2½-inch webs, of 7/32-inch material and strongly reinforced in the centre. The frames have four cross members, with heavy gusset plates.

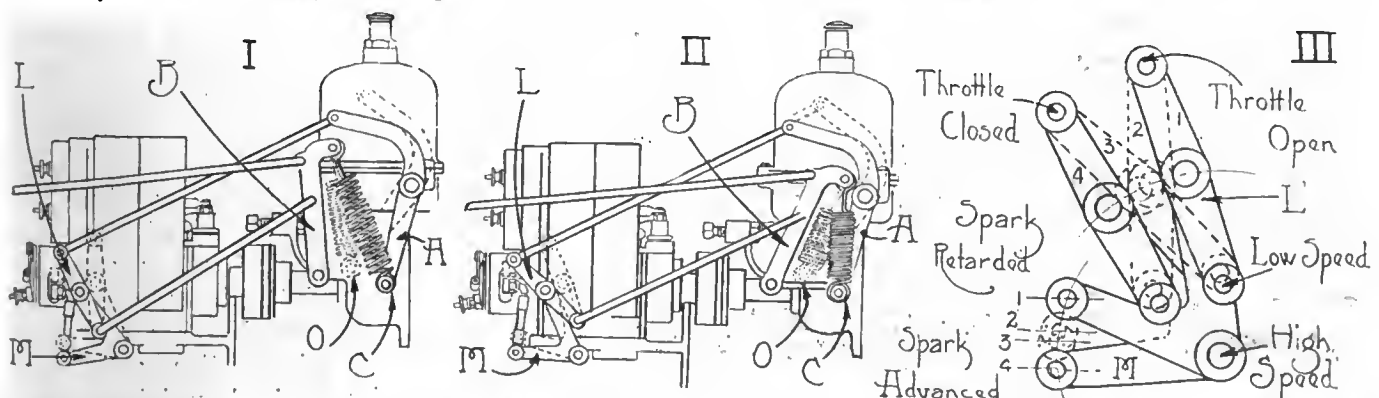
The springs are semi-elliptic and very carefully designed and constructed. Those of the 1500-pound truck are 40 inches length and two inches width forward, with seven leaves, and the rear springs are 50 inches length and two inches width, with nine leaves; those of the 2000-pound truck are 40 inches length and 2¼ inches wide forward, with seven leaves, and the rear springs are 50 inches length and 2½ inches wide, with eight leaves; those of the 4000-pound truck are 40 inches length and 2¼ inches width, with seven leaves forward, and the rear springs are 50 inches length and three inches width, with 10 leaves; those of the 6000-pound truck are 40 inches length and 2¼ inches width and the rear springs are 50 inches length and 3½ inches width. All of the rear ends of the springs are shackled and the forward ends of the rear springs are pivoted in very heavy hangers mounted outside of the frames. All the spring eyes are bushed and the bolts are hardened and ground.

#### The Control Members.

The steering gears are an irreversible worm and nut type of specially heavy construction that are installed at the left sides. The linkage is very substantial and is expected to have very long service life.

The trucks are controlled by the usual pedals for operating the clutches and the service brakes, by gear shifting and emergency brake levers placed in the centres of the footboards, and throttle levers on the steering wheels. The service and emergency brakes of the 1500-pound truck are internal expanding, with shoes 2½ inches width, acting within drums 15 inches diameter on the rear wheels; the service brake of the 2000-pound truck is external contracting and the emergency brake is internal expanding, on and in drums 15 inches diameter and 2½ inches wide on rear wheels; the service and emergency brakes of the 4000-pound truck are both internal expanding, with shoes 3¼ inches width acting within 16-inch drums on the rear wheels; the service and emergency brakes of the 6000-pound truck are internal expanding, the wheel drums being 18 inches diameter and the shoes 3½ inches wide.

The chassis are sold either with or without bodies, the equipment being supplied in standard types or built to specifications. The loading space of the 1500-pound truck is 88 inches length, that of the 2000-pound truck 87 and 130 inches, that of the 4000-pound truck 130 and 154 inches, and that of the 6000-pound truck 130 and 154 inches, unless the bodies overhang the chassis frames. The chassis are sold with the usual equipment of driver's seats, front fenders, running boards, oil dash and tail lamps, horns, jacks, tool kits, etc. The price for the 1500-pound chassis is \$1000, for the 2000-pound chassis \$2000, for the 4000-pound chassis \$2450, and for the 6000-pound chassis \$3100, f. o. b., Clyde, O.



The Control of the Krebs Governor: Fig. 1, the Position of the Linkage at High Speed; Fig. 2, the Piston at Low Speed; Fig. 3, the Variations Between High and Low Speeds—This Interconnects the Fuel Throttle and the Magneto.

## MOTOR EXPORTS INCREASE.

### November Figures Show Continued Demand from All Parts of the World.

Export figures on motor vehicles for November show that the unprecedented increase is keeping up. England is still the largest buyer, but increases of from 300 to 800 per cent. in the number of vehicles taken by British and other Oceania, Asia and South America are to be noted. Quite remarkable is the gain shown in trade with nations that are not participating in the war, although the figures are comparatively small when compared with those of Europe.

The November exports totalled 5343 automobiles of both passenger and commercial types, valued at \$6,628,814. Of these the largest single allotment again went to England and the United Kingdom, which amounted to 1534 vehicles. As compared to November of the year before when the war exports had already reached a large figure, this showed an increase of 100% for trucks and 500% for passenger cars.

British Oceania, which took 115 cars in 1914, took 832 in 1915, an increase of nearly 800 per cent. The West Indies and Bermuda show an increase of about 400 per cent. South America 300 per cent. and Asia and other Oceania 800 per cent. During the first 11 months of 1915 exports reached 58,623 cars of all types, valued at \$88,248,447, which is an increase of 300 per cent. over the same period of 1914.

France, which bought the most vehicles when the war was first begun, was soon superseded by Great Britain as the leader. During the 11 months ending November, the United Kingdom got 22,989 automobiles, valued at \$33,086,049, and France 5881, valued at \$14,887,732.

Parts, tires and motors are increasing rapidly. Motors in particular increased from 203 to 4158, or about 2000 per cent. Imports declined to 19 cars in November, as compared to 62 in the previous November. Imports of rubber increased 100 per cent. for the month to \$9,576,271, and for 11 months reached \$102,116,436.

## ROAD BUILDERS MEET IN PITTSBURG.

Governors of the various states and mayors of the cities have been invited to attend the convention of road builders which will be held in Pittsburg beginning Feb. 28. It will be known as the Sixth American Good Roads Congress, and the Seventh National Good Roads Show. Mayor Armstrong of Pittsburg has sent personal invitations to mayors of 3000 cities. Engineers of all sorts engaged in road work have also been invited and contractors, too, are included.

Makers of all types of road machinery have reserved space in the show. No similar exhibition of national scope was held during 1915. The show will be made a local demonstration in favor of good roads in Pennsylvania. E. A. Bigelow, James Francis Burke and George S. Oliver are members of the committee that has had charge of securing speakers. The event is expected to give the building of good roads throughout the country a great impetus.

## LONG TRUCK FREIGHTAGE.

Railroad congestion, making it difficult to get freight from Philadelphia to New York by the regular channels, gave George W. Mink, Jr., of Philadelphia the idea of operating a New York and Philadelphia truck line. He started with one five-ton Pierce-Arrow truck and now has three in operation. A number of Boston firms are said to be shipping to New York by boat and thence to Philadelphia by motor truck.

## CHEAP MOTORCYCLE DELIVERY.

Figures on delivery cost with a modern two-cylinder motorcycle with side van have recently been compiled by J. Blachs & Sons, a department store operator in Birmingham, Ala. This shows an average cost of operation of 1.05 cents per mile.

The motorcycle delivery van covered 19,500 miles and made 24,960 deliveries. It used 390 gallons of gasoline at a cost of \$61.11, and for lubrication 62 gallons of oil, costing \$25.40, while the transmission oil consumed cost \$3.25. The repair costs came to \$54.41 and tires and tubes to \$55.77. Other charges were: Carbide for lighting \$2.25, and a city license at \$3. The total cost of operating the vehicle for the year, not counting wages, was \$205.19, at an average cost of \$.0105 per mile. The car covers 50 miles on a gallon of gasoline and carries a load weighing 500 pounds.



Three-Ton Muck Chassis Equipped as a Combination Hose and Chemical Apparatus Attached to Engine Company No. 25 of the Boston Fire Department.

### TALKS ON WORM DRIVE AXLES.

A talk on worm gearing in industrial machine work was given Feb. 16 before the Buffalo Engineering Society by Cornelius T. Myers, chief engineer of the Timken-David Brown Company, Detroit, Mich. He showed that modern methods of production have increased the efficiency of the worm gear to the point where it is a great favorite of engineers, where a large power reduction is required. He discussed the ease with which this gearing is kept in adjustment, is kept lubricated and its durability in exceptionally hard service.

He displayed slides depicting the use of the worm in bottling machines, coal hoists, elevators, power generators and starting mechanisms. The prevalent tendency toward high speed machines and the endurance of the worm to the high pressures such service entails has recently attracted great attention among engineers.

### FIFTH AVENUE 'BUSES ADOPT HEATERS.

Careful tests of trial heaters for several months have resulted in the adoption by the Fifth Avenue Coach Company of New York City of the Perfection Heater, made by the Perfection Spring Service Company of Cleveland, O. The order calls for 240 heaters, which are to be delivered as soon as possible and installed at once. Another type of heater made by the same company has been used on many taxi cabs in New York and on private cars all over the country.

### MANY WHITE TRUCKS IN USE.

The White company declares that in spite of the higher price of its trucks, American owners operate twice as many as of any other make. One group of 37 owners operate 1571 White trucks. Among these users are the Gulf Refining Company, 183; Standard Oil Company of Indiana, 126; Standard Oil Company of New York, 119; United States Postoffice Department, 109; Armour & Co., 92, and the Atlantic Refining Company, 91.



### POWER ELEVATING BODY.

#### New Type of Chute-Discharging Equipment for Gram-Bernstein Trucks.

The Gram-Bernstein Company, Lima, O., builder of Gram-Bernstein trucks, has just produced an unusual type of body equipment for a 5-6-ton truck which was purchased by A. Cherney, a coal dealer of Chicago, Ill. The machine is intended for the delivery of coal in bulk and in quantities that will range up to the capacity of the body. One of the necessities of profitable truck operation in coal haulage is carrying the largest loads that are practicable, and where family orders are taken they will often be comparatively small.

The body was designed to meet all the conditions that experience could suggest and to have every facility for quick discharging. Coal cannot always be discharged by dumping and very frequently it must be carried from the truck or cart, because the vehicle cannot be located near the manhole or window or chute through which it is delivered. Neither is it always practicable to back a truck to a point where it may be dumped because of the narrow streets and alleys, which cannot be obstructed.

The body constructed for this company is steel, with a hopper like bottom so that all of the load will concentrate by gravity without much trimming. The body is deepest in the centre, where the bottom is close to the chassis frame, but the sides are practically straight. This is mounted on the chassis inside of a frame of steel that is nearly the height of the sides.

Under the body and in the centre is a hydraulic cylinder mounted upright within a tube, in which there is a plunger that is raised or lowered by a circulation

The Body Raised to Its Full Height Above Body Frame.



New Type of Power-Elevating, Chute-Discharging Body for Coal Delivery, Specially Designed as Equipment for Gram-Bernstein Trucks.

of oil forced by a small rotary pump that is driven by the engine. The movement of the pump is controlled by simply moving a small valve lever, and the body can be stopped at any height, either elevating or lowering, by placing the lever in what is known as the lock position.

The body is lifted and lowered by the pump within the frame, having a range of movement of about 3½ feet above the frame, and when raised a chute can be placed beneath gates in the bottom, from either side or the rear, from which the coal can be discharged very quickly. These gates may be latched securely when not needed. The position of the body in the frame is insured, even with the weight in one end, by the shafts and toothed racks and pinions that are at each corner, these firmly supporting it. The body may be divided into any reasonable number of compartments for different orders, and no matter how the freight is distributed there is no undue stress upon the frame or body.

#### NEW YORK STATE LEGISLATION.

New York City contains so large a portion of the property in New York state that it is obliged to pay a very large part of the state taxes. The funds from which the famous New York state roads are built are drawn to the extent of 70 per cent. from the city. The city dwellers naturally feel that it is unfair that they should pay so large a proportion of the expense for roads in parts of the state where they never travel. For this reason a bill which seeks to remove the expense of maintaining state highways from the state and place it as before on counties and towns, is likely to secure much support from the present legislature. From the point of view of good roads the bill is extremely reactionary and if past experience is reliable would result in the quick deterioration of the roads. Counties and towns of a certain class are obliged under the provisions of the proposed law to pay half the cost of maintenance.

#### NEW AUTO CAR BUILDING.

Continuing the expansion which brought into existence several new buildings last year, the Autocar Company of Ardmore, Penn., has contracted for a new building which will have 85,000 square feet of floor space. It will be used for building and finishing truck bodies and for the final assembly of trucks.

#### PENNSYLVANIA S. A. E. ORGANIZES.

The organization meeting of the Pennsylvania S. A. E. was held at the Engineers' club in Philadelphia, Feb. 16. The chief feature of the evening was a paper by A. M. Dean on "American V Type Motor Development."

#### BIG SHIPMENTS IN JANUARY.

In spite of the famine in freight cars which prevented the shipment of many of the cars and trucks that were produced, or might have been produced had transportation been available, 18,054 car loads of automobiles were shipped during January as compared to 8369 a year ago.

This is an increase of 115 per cent. This unusual increase in the winter months, when trade is usually duller, is looked upon as one of the most favorable signs for an overwhelming trade during the buying season in the spring. The adoption of convertible bodies and the increasing use of the automobile as a necessity, instead of a luxury, is making the volume much more even the year around.

Some of the heavy shipments are undoubtedly brought about also by the fact that many dealers who were short of cars last year are buying heavily and early, with their own money, to have the cars on their floors when customers are ready to take them.

#### COUSINS AND SEIBERLING HONORED.

James Cousins of Detroit, former vice president of the Ford Motor Company, and Frank A. Seiberling of the Goodyear Tire and Rubber Company, Akron, O., have been made directors of the Chamber of Commerce of the United States. Cousins was elected to fill a vacancy caused by the resignation of Henry B. Joy, president of the Packard Motor Car Company. There are 13 directors in all.

The chamber is going to take referendum of its members on the question of maintenance of resale prices; it indorsed a tariff commission and criticised the government's shipping bill as unsatisfactory.

#### LAMP BLACK IN BIG DEMAND.

Scarcity of oxide of zinc, which has caused many tire manufacturers to adopt black instead of white rubber for their automobile tires, has opened a great new market for lamp black. Formerly the paint manufacturers, who used most of this product, produced it themselves. It is pure carbon and is made by burning oil under a revolving drum from which the carbon is scraped by a knife in contact with the surface.

#### BIG NEW OIL COMBINATION.

E. L. Doheny, president of the Mexican Petroleum Company, says that the Pan-American Petroleum and Transport Company will control greater oil producing fields than any other concern. The company is capitalized at \$150,000,000. The companies in the combination are the Mexican Petroleum Company, the Petroleum Transport Company, the Caloric Company and the Buena Fe Petroleum Company.

# **UNIVERSAL TRUCK ACCOUNTING SYSTEM**

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It affords every detail of time and work of any number of machines, the labor, operating cost, revenue and earnings, with comparisons for any period, in one record book and day cards for each truck.

The simplest and most comprehensive record ever conceived, adaptable for use with any method of house bookkeeping or independently, that can be made to serve as part of any method of accountancy.

The most intensely practical system of accounting ever devised, that can be maintained by a girl clerk and which has no limitations.

*Published by the*

***Automobile Journal Publishing Co.***

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***Pawtucket, R. I.***

***Demonstrated at the Boston Automobile Show  
Automobile Journal Booth***

# Universal Truck Accounting System

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## *What it Is—*

The only system that will give every record in one book.

But 14 pages are required for a full year's record for any one truck.

This record can be increased to include any number of machines in one book.

A day card for each truck, filled jointly by a clerk and the driver completes the system.

The driver has but a few entries to make on any job and any girl clerk can keep complete record for one or 100 trucks.

This system of a day card and record book will take the place of any number of record forms and give the information in greater detail.

This system is so remarkably complete and simple that any truck owner needs but an office day book in which to enter orders and a cash book and ledger.

This system can be utilized with any method of house bookkeeping without conflicting with it. Or it can be operated independently of any form of accounting.

## *What it Does—*

Shows miles driven loaded and light.

Shows the time the trucks leave and return to the garage.

Shows driver's working time, hours in and out of garage.

The owner will receive an exact report of the work done.

Shows record of accidents, causes, place and names of witnesses.

He will have knowledge of the mechanical condition of the machines at all times.

Shows the daily mileage and the mileage for each job, and average speed per hour.



**Shows driver's hours of work on any job.**

**Shows parts ordered, by whom, and the cost.**

**Shows record of undelivered goods and breakages.**

**Shows helpers' names and hours worked on any job.**

**Shows mechanical adjustments, repairs, inspection (when and by whom).**

**Shows average daily overhead expense, interest, taxes, insurance, and storage.**

**Shows when truck is withdrawn from service, time, cause and time of withdrawal.**

**Shows total cost of daily service, wages, supplies, repairs, overhead tires and tubes.**

**Shows repairs, work done by either driver or repairer, on the road or in the garage, what was repaired, time taken and the cost.**

**Shows revenue from truck service, depreciation, salvage, labor, work value, whether regular route, special trips, rented or job.**

**Shows tire record, giving accurate mileage for each tire, the cost of tire repair work, tube cost and repair, new tire cost, and tire adjustments made.**

**Shows driver's daily garage expense, cost of supplies, gasoline, current, oil, grease and miscellaneous items, whether supplied in the garage or on the road, and the cost.**

**Shows supplementary delivery form and record; when a number of items are to be delivered from any load, gives names and addresses for deliveries, the amounts to be collected or charged, time delivered, who received the goods delivered and the reasons for failure to deliver.**

**Shows office instructions to drivers, whether regular work or route, trip, rented or job; the time the truck started on work where to report, customer's name, address, time load was delivered, destination, whom delivered to and where delivered, time delivered, received by whom, time returned and total mileage, miles loaded and light, whether the driver was to collect for the work, whether the work was charged, the price, time delayed, the cause and driving time, the character of the load, whether bales, barrels, cases or bulk, the known or estimated weight.**

# ***What the System Will Tell the Owner at a Glance***

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**His total investment in the truck, the cost of operating it, and what the truck earns.**

**The exact cost of operating by item, any one truck against another, or in differing works.**

**Itemized statement of operating and overhead expense and truck revenue by days, weeks, months and annually, for comparison.**

**Cost of wages.**

**Cost of supplies.**

**Cost of accidents.**

**Mileage of every tire.**

**Days worked and days idle.**

**Mileage from gasoline and oil.**

**The work that is most profitable.**

**Cost of overhead or fixed charges.**

**The losses and the causes of losses.**

**Cost of repairs and the nature of repairs.**

**The efficiency of certain trucks for certain work.**

**The efficiency of drivers as measured by operating expense and revenue earned.**

**An average of operating and overhead expense and truck revenue for any given period, either days, weeks, months or annually, for comparison.**

**A total expense of operating and overhead for each month, the total for any number of months, and the average daily and monthly expense in comparison.**

**A trial balance for any period, showing the investment, the total expense of operating it, the revenue from operation, the depreciation earned, the market value of the machine, and the net loss or gain from ownership.**

**It checks waste in operating expense, in labor and mileage driven; it checks the driver and the garage; it checks fast driving, overloading and truck and tire abuse; it checks every garage expense and it checks the work done on the machine and its condition.**

### TRUCK WINNER OVER HORSE.

An owner of a 1½-ton Federal truck, who also operates horse teams, attached hub recorders to the machine and a wagon in order better to compare their earning capacity in his business. The wagon was loaded and unloaded in exactly the same manner as the truck, but the machine covered 3.66 miles to every one for the team. The truck hauled each load twice as far, yet it made twice the number of deliveries. The running and stopped time progress made by the team figured out at 1.64 miles, while for the truck it was 7.15. This greatly increased earning capacity cost the operator \$1.28 per day more.

### WANT FARM TRACTOR RATINGS.

The increase in the number of farm tractors has made apparent the necessity for a standard rating for tractors, and one is likely to be shortly worked out. The Department of Agriculture has interested itself and urges that purchasers, until such a standard is established, pay more attention to the amount of work the different tractors will do under the same conditions with the same consumption of gasoline than to the catalogue rating.

### REGISTERS FOR ILLINOIS GARAGES.

A demand is being made in Illinois for a register to be kept in every garage showing the number of every car that enters. A similar law is in force in several eastern states. The purpose of it is to make easier the detection of car thieves.

### GENERAL MOTORS BUSINESS DOUBLES.

For the first six months of the present fiscal year ending Jan. 31, the business of the General Motors Company doubled as compared to a year ago. The total business for the six months was \$74,000,000, as compared to \$36,857,394 for the same months in the previous year. This is a gain of \$37,000,000. The undivided profits are \$13,000,000, as compared with \$6,446,534, a gain of more than \$6,600,000. After deducting \$524,482 for preferred dividends, \$12,475,518 is left as undivided profits for the six months' operations. The number of cars and trucks sold was 62,468, as compared with 31,608 in the same period of the previous year.

In his statement President Nash declared that the increase would probably not continue through rest of year on account of material and freight car situation.

### MAY MERGE ASSOCIATIONS

#### Members of the Electric Vehicle Association to Vote on Proposal March 10.

As an outcome of the discussion of the advantages of closer co-operation between the National Electric Light Association and the Electric Vehicle Association, President E. W. Lloyd of the National Electric Light Association has written a letter to W. H. Johnson, president of the Electric Vehicle Association, inviting that body to join with the larger organization as one of its subordinate sections. This invitation was extended in accordance with a vote on the subject by the National Electric Light Association.

The letter suggested that the matter be acted upon at once so that in case the invitation was accepted the electric vehicle section might take part in the convention of the light association, which will be held in Chicago, May 22 to 26. There is to be an exhibition in connection with the convention and arrangements would be made to display and demonstrate electric vehicles.

On Feb. 14 the council of the Electric Vehicle Association acted favorably on the suggestion and the question of amalgamation is now up to the members of the association. The result of the combination would be to place the head of the electric vehicle section on the executive committee of the larger body so that he could represent effectively the vehicle interests in the trade body.

Members of the association have been sent blanks on which they are asked to make Frank W. Smith of New York and A. Jackson Marshall proxies for them in the vote on the question at a special meeting to be held March 10, at 29 West 39th street, New York City, and instructing them to vote for the amalgamation. It also contains a pledge to join the National Electric Light Association as an individual.

George B. Dryden is president of the Dryden Rubber Company, which manufacture automobile tires in Chicago.



Worm Driven Service Truck with Body Equipment for the Use of a Chicago Contracting Company.

## OLD TRUCKS IN NEW FIELD.

### Diamond T Worm Driven Machines Distributed from New York City.

The Diamond T Motor Truck Company of New York, Inc., with headquarters at 245 West 55th street, New York City, has been established for the purpose of distributing Diamond T worm driven trucks in New England, New York, Eastern Pennsylvania, New Jersey, Delaware, Maryland and the District of Columbia, and all export sales, and this concern is prepared to afford to dealers in this section of the country and to all purchasers of Diamond T trucks the same attention and service that would be afforded by the manufacturer, the Diamond T Motor Car Company, Chicago, Ill.

Diamond T trucks are exceedingly well known in the Middle West and West, but while they have been built and sold for more than 10 years, this is the first endeavor of the manufacturer to exploit the eastern section of the nation. The Diamond T Motor Car Company is one of the pioneers of the industry. Its factory is equipped with every facility for producing high-grade machines, its workmen are skilled and well trained, and the policy has always been to build trucks that will measure up to the best standards of the industry.

There is nothing experimental in Diamond T trucks. To the contrary, they represent the most advanced engineering in design and construction, and they are built of units that have been developed and perfected by the specialists of the power wagon industry. These components are known the world over and are recognized as having every quality that could be demanded or incorporated in a freight carrying vehicle.

These machines are constructed with unit power plants made up of Continental engines, Brown-Lipe clutches and transmission gearsets, Rayfield carburetors, Bosch ignition, Timken front axles, Timken-David Brown rear axles, Spicer universal joints, A. O. Smith frames, Gemmer steering gears, Mather springs and

Schwarz wheels. In fact, there is not a part that is not regarded as being thoroughly proven for economy, endurance and efficiency by service and experience. These units are incorporated into designs that are in every way harmonized and the trucks may be said to be standardized in the fullest sense of the term.

The trucks are built in  $\frac{3}{4}$ -ton, one-ton,  $1\frac{1}{2}$ -ton, two-ton and  $3\frac{1}{2}$ -ton load capacities, and the prices for the chassis are respectively \$1175, \$1485, \$2050, \$2200 and \$3300.

The Diamond T Motor Truck Company of New York, Inc., has begun an aggressive sales campaign in the states for which it is distributor, and it is now establishing agencies in various commercial centres. Its policy is to have machines of all types at New York ready for immediate shipment, to carry a very large stock of parts of all kinds, and to have its organization co-operate to the fullest extent with its agents and the purchasers of Diamond T trucks. This will mean prompt deliveries, quick filling of parts orders and personal attention to customers.

The company will begin its New England sales campaign by exhibiting a full series of Diamond T machines at the Boston automobile show, at space 201, from March 4 to 11 inclusive.

### MICHIGAN AUTO LAW CONSTITUTIONAL.

The recently enacted Michigan automobile tax law withdraws about \$15,000,000 worth of motor cars from taxation as personal property in Detroit, and for that reason was attacked by the city government in the courts. The corporation counsel has lost the case in the circuit court and has appealed it to the supreme court. The law was declared constitutional.

### PACKARD PAY ROLL OVER A MILLION.

The pay roll at the Packard factory for the first half of February was \$540,000. There are now 13,023 persons employed at the plant. The output is 50 passenger cars and more than 20 trucks a day. Purchases of material amount to more than \$2,500,000 a month.

With the completion of two new buildings, which will be ready for use March 1, the extensive construction programme which has been in progress for the past year will be finished. The two new buildings will be devoted to the construction of enclosed bodies. The floor space, including the two buildings, now is 54 acres. There are 49 buildings. The factory site is a mile long and 1000 feet wide.



Boston Department Store, Chicago, Fleet of 17 Diamond T Trucks.



**R**ELATIVELY large load capacity and small operating expense are the two factors in motor vehicle haulage that appeal to the business man. Strange as the statement may appear, those who purchase transportation equipment generally believe that the fullest economy ought to be insured to them, no matter what their system of collection or delivery or the conditions in which the work is done, and they assume that the greatest possibilities ought to be realized without the careful attention to administration and supervision so essential to efficiency and economies.

Production of vehicle units that would, because of their design and small operating cost, appeal to those who have need of delivery or haulage service has been carefully studied by practically every manufacturing interest of the industry, the object being to produce what would have sufficient load capacity and, in addition to being comparatively low in first cost, be dependable and enduring and have extreme utility.

Production cost makes for ultimate economy to a greater degree than any other single factor, and if this can be regulated or controlled, a great deal has been accomplished. Undoubtedly, standardization and simplicity are sought by all because of the bearing which each has upon production, and manufacturing will re-

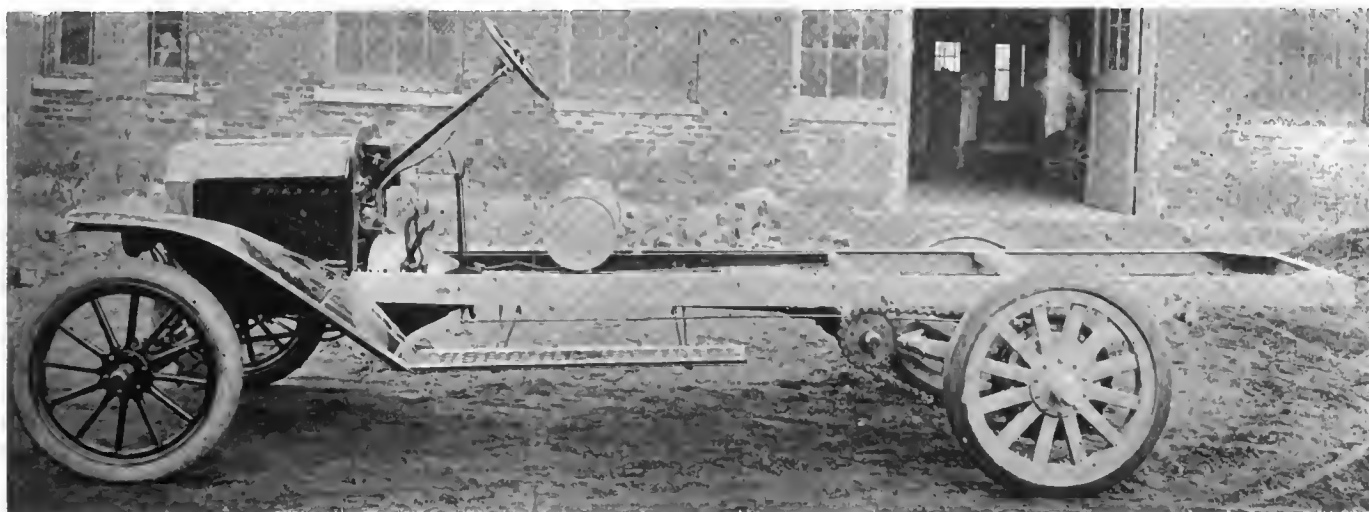
duce the expense of each unit as the volume or number is increased.

#### Adaptation of Ford Chassis.

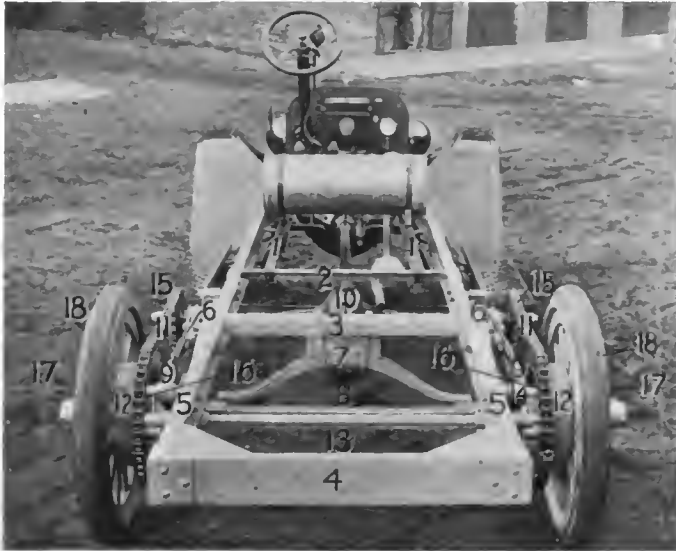
The policy of the Smith Form-a-Truck Company, Chicago, Ill., is adaptation to a certain extent. That is, instead of manufacturing an entire vehicle it avails itself of the production economy of the Ford Motor Company, which is regarded as being one of the most remarkable of all the enterprises identified with the motor vehicle industry, and plans constructing on a very large scale what will adapt a Ford chassis to the haulage of loads up to one ton.

The company is now constructing these units, which consist of a frame, springs, radius rods, rear axle and wheels and tires, which are shipped or supplied ready for converting or "forming" a substantial freight carrying vehicle from a Ford chassis, and the application of the rather unusual title of the company is understood when this explanation is read. With this equipment available the man who wants a truck of 2000 pounds capacity can readily convert a new or a used Ford chassis to a Form-a-Truck chassis, and install on it whatever type of body will best meet his requirements.

First of all the purchaser obtains in the Ford chas-



Stripped Chassis of 2000 Pounds Capacity Truck, This Being the Standard Conversion of a Ford Pleasure Car Chassis with a Smith Form-a-Truck Unit.



The Components of a Smith Form-a-Truck Unit.

- |                            |                           |
|----------------------------|---------------------------|
| 1—Ford Frame Side Members. | 10—Jackshaft.             |
| 2—Front Cross Member.      | 11—Chains.                |
| 3—Centre Cross Member.     | 12—Brake Drums.           |
| 4—Rear Cross Member.       | 13—Spring Shackle Tie Rod |
| 5—Frame Side Members.      | 14—Spring Shackles.       |
| 6—Springs.                 | 15—Front Sprockets.       |
| 7—Jack Spring.             | 16—Rear Sprockets.        |
| 8—Rear Axle.               | 17—Wheels.                |
| 9—Radius Rods.             | 18—Tires.                 |

sis a standardized machine that is comparatively cheap because it is built in such large numbers. Not only does this apply to the first cost, but to all maintenance expense so long as the machine is in use, and with consistent care and attention the vehicle ought to be serviceable for from three to five years. In fact, the service life of the unit is largely dependent upon the willingness of the owner to carry loads that do not exceed the rating and to make adjustments and repairs whenever these are necessary. Neglect must be guarded against so far as this is possible, and simplicity will make for a better degree of attention.

While the purchase price of the chassis is low because of the quantity production and standardization, the same reasons obtain for the extremely moderate cost of the Form-a-Truck equipment, which has been

simplified from every point of view and is a satisfactory unit for service where speed and power are necessary for haulage and delivery, especially for business men who must afford their customers careful attention.

#### Meets Very Large Equipment Demand.

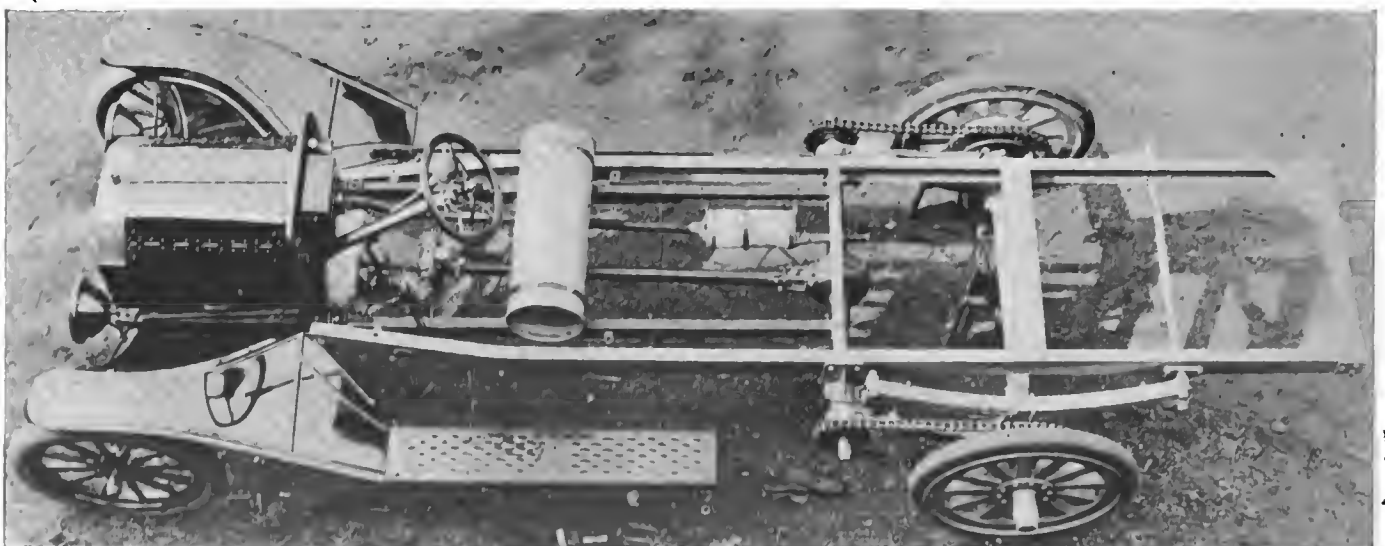
Analysis of such data as is obtainable shows that more than 50 per cent. of the highway vehicles used for haulage are not more than 2000 pounds load capacity, which would appear to indicate that the possible market for machines of similar capacities is very large. Assumedly a light truck will be expected to do as much haulage as three horse wagons, but the relative proportions are not changed in the event of replacement of the latter by the former. What is really wanted is equipment that will afford faster and more frequent service rather than the transportation of a given tonnage. This being so, the possibilities from a business point of view of the Smith Form-a-Truck equipment are almost unlimited, despite the plans for extremely large production.

The Smith Form-a-Truck policy is to provide what can be purchased by any person and, without special tools or machine facilities, convert Ford pleasure car chassis into practical and economical vehicles. The Smith Form-a-Truck attachment is designed to utilize practically all of the Ford chassis, there being nothing of value that is discarded, and most of the parts that are removed can be later used, being reserved as spares in the event of accident or deterioration.

#### The Form-a-Truck Unit.

Primarily the Smith Form-a-Truck is a combination of a Ford chassis with the rear cross member of the frame, the rear spring, the rear wheels, emergency brake, radius rods and rear fenders removed, and the construction that consists of a frame, radius rods, rear springs, rear axle, rear wheels, rear wheel brake and brake rod, the original Ford rear axle being converted to form a jackshaft by which the machine is driven by side chains.

The truck is driven by a power transmission sys-



Top View of the Truck Built with the Smith Form-a-Truck Unit. Showing the Reinforced Centre Frame, the Jackshaft and the Driving System.





The Smith Form-a-Truck Unit Complete, Ready for Converting the Ford Pleasure Car Chassis Into a Truck.

the Ford chassis side members are riveted to the forward cross member of the Smith Form-a-Truck frame, and the forward ends of the side members of the Smith Form-a-Truck frame are riveted to the Ford chassis side members at points where the dash brackets are bolted, the ends of the frame being directly behind the dash. The Ford chassis frame side members

tem that is unchanged, but this system is extended by the addition of the side driving chains, and because of the radius reduction the engine can be operated at its most efficient speed. That is, it can be made to develop extremely efficient power without driving the vehicle faster than good judgment would dictate. At this point statement may be made that the Ford engine is designed to be driven at what is known as moderate speed—having a practical maximum of 1500 revolutions a minute, at which its greatest power is developed, and which can be practically utilized by the use of comparatively light components and sufficient reduction at the rear wheels to safely and efficiently apply it. An operating condition obtains that is recognized by all engineers, and this is that lighter parts can be used with high speed than with slower speeds, without sacrificing safety or endurance.

#### The Frame of the Unit.

The Smith Form-a-Truck frame may be said to be the principal element, this being constructed of two side and a rear member of rolled steel channel section four inches width with wide webs. The corners are reinforced by triangular boxes that cover them and which, with the large gusset plates, are strongly riveted. There are two cross members, the forward member being located directly above the jackshaft and the other directly above the rear axle, with a heavy tie rod carried in brackets that carries the lower ends of the rear shackles of the springs.

The curved rear member of the Ford chassis is removed and the ends of

do not telescope the Smith Form-a-Truck frame. As will be noted from the accompanying illustration, the Ford chassis side members are straight and the forward ends of the Smith Form-a-Truck frame are "necked" or cambered, so that there is a double frame from the jackshaft to just ahead of the motor supporting arms. This greatly strengthens the chassis and increases its resistance to load stresses between the axles. The gasoline tank and the muffler are carried on the Ford frame, which may be regarded as a supplemental or auxiliary frame.

#### How the Jackshaft Is Mounted.

The combination jackshaft and spring shackle hangers are heavily built and are bolted to the Form-a-Truck frame directly at the ends of the forward frame cross member, being secured by bolts through the top webs and the sides of the channels. The hangers are wide and have firm anchorage, and extend at either side of the frame, affording very substantial supports for the jackshaft, there being vertical webs from the sides of the hangers to the jackshaft carriers. The upper sections of the hangers at the rear ends carry the bolts for the forward spring shackles, and outside of these shackles are seats for the forward ends of the radius rods. The radius rods are designed to rotate on the seats, so there is no stress upon the jackshaft hangers other than from driving and braking thrust.

The lower sections of the hangers are bolted to the upper parts and may be quickly removed whenever necessary.



Examples of the Smith Form-a-Truck Chassis Equipped with Covered Bodies: Above, a San Francisco Baking Company's Delivery Wagon; Below, at Left, a Chicago Department Store's Equipment; at Right, a United States Mail Van in Service at Racine, Wis.



The Interior of the City Salesrooms at 1470 Michigan Boulevard, Chicago, Ill.

The rear brackets for the springs are so mounted that they reinforce the frame as well as support it, and they are connected by a stout tie rod that prevents the springs spreading and extreme distortion of the frame. The ends of this rod, outside of the brackets, carry the lower ends of the shackles.

#### **Springs, Axles and Brakes.**

The springs are semi-elliptical, 42 inches length and two inches width, with 10 leaves, and they are so shaped that when loaded they are very nearly flat, the ends being so shackled that there is no resistance to vertical movement of the frame, and being outside the frame, the centre of gravity is low and there is minimum sidesway. Mounted in the centre of the second cross frame member is an auxiliary or jack spring that is semi-elliptic in shape, the ends of which contact with pads on the dead rear axle when the machine is partially loaded, and which materially lessens the stresses upon the side springs on rough roads or paving.

The side springs are mounted on a rectangular axle,  $2\frac{1}{4}$  by  $1\frac{1}{4}$  inches section, that is conventional in form and construction, and which is equipped with artillery type wooden wheels, each having 12 two-inch spokes, which are shod with Firestone pressed-on type solid band tires, 32 by  $3\frac{1}{2}$  inches. On the wheels are pressed steel emergency brake drums that are 12 inches internal diameter and  $2\frac{1}{2}$  inches face, in which are fitted the internal-expanding brake shoes, these being anchored to and operated by camshafts mounted on flanges formed integral with the axle. The brake shoes are not enclosed. They are faced with a heavy anti-friction fabric.

#### **Jackshaft and Driving System.**

The wheel driving sprockets, which have 42 teeth each, are secured to the peripheries of the brake drums. The sprockets are bolted to the drums and may be removed by loosening the series of

retaining bolts. The jackshaft is the regular Ford rear axle, which is converted by the removal of the brake flanges from the outboard ends of the housing, this leaving the housing so that it may be fitted to the jackshaft hangers. The long hanger bearings clamp the housing ends securely, affording great rigidity of the shaft. The ends of the shafts, on which the rear wheels were keyed, are fitted with spiders carried on substantial hubs, and on these the 20-tooth sprockets are bolted, six bolts retaining each sprocket. The shaft ends are enclosed by sleeves, that carry the spiders, on which the hub caps are fitted. This completes a very neat and simple assembly. The driving chains are Baldwin made, heavy roller type,  $\frac{3}{4}$ -inch diameter roller,  $\frac{5}{8}$ -inch wide with  $1\frac{1}{4}$ -inch pitch.

The emergency brake is connected by rod linkage with the standard Ford hand lever, which is mounted on the Ford or original frame unchanged, this giving the regular means of control. This brake is interconnected with the low speed ratio pedal, the lever having an upright, or neutral, position, and engaging the direct drive clutch when in the forward position. When the lever is drawn backward it engages the emergency or rear wheel brake and by a latch may be set in any desired position.

#### **Wheelbase Lengthened 25 Inches.**

When the conversion is completed, the Ford chassis length of 100 inches has been greatly increased. The Smith Form-a-Truck frame is 168 inches length and when it is installed the wheelbase is increased to 125 inches, from 100 inches, but there is a very large overhang of the frame back of the rear axle. The axle is so located that 90 per cent. of the load when equally distributed is carried on it, this leaving but 10 per cent. for the front axle. The loading space back of the driver's seat is 108 inches or more, this depending upon the type of the body. The weight of the Smith Form-a-Truck unit is 1000 pounds, and when attached to a Ford chassis the total weight is 2000 pounds. The price of the unit is \$350 f. o. b. Chicago. It is guaranteed against defective material or workmanship for one year.

When converted the owner has a machine that has



The Steel and Concrete Plant Now Being Erected That Will Have a Production Capacity of 80,000 Form-a-Truck Units a Year.

practically the operating economy of the Ford chassis, it is very economical of tires because it is equipped with pneumatic tires forward and solid tires at the rear, and it has at least 1200 pounds more load capacity than the Ford chassis fitted with any standard body.

#### **Invented by Marine Engineer.**

The Form-a-Truck unit is the invention of A. D. Smith, who was a marine engineer and who was located at Seattle, Wash., where he carefully investigated the problem of developing cheap and enduring transportation facilities. He went to Chicago in May, 1915, to purchase material for building from 40 to 50 units, expecting to begin constructing them at Seattle. He interested several Chicago men in his patent and began building one to demonstrate its utility. When completed it was tried in varying services and proved to be so efficient and economical that the Chicago men organized a company which was to have the manufacturing rights for the country east of the Rocky mountains, leaving Smith the Pacific Coast to operate in, but in August, 1915, the selling company decided to take over Smith's production, and plans were determined that established the Smith Form-a-Truck Company in Chicago. A factory was established in a leased building at 411 North Claremont avenue and general office located in the Adams Express building in Dearborn street.

The company began its activities with the purpose of marketing 2000 units in a year and the plans were rather uncertain. During September the orders received had totalled 3200, the capacity of the factory was reached, cost of material was increased, and with unbounded faith the company determined upon a production of from 40,000 to 50,000 the first year. Material was bought in large quantities and the wisdom of this was evidenced by the advances, which if the stock was sold to other manufacturers, would yield a substantial profit.

The factory production was increased from three to 10 units, and then to 50 a day. Then the possibilities were realized and the company organized its selling and distributing department in charge of men of large experience, S. D. Porter, for 16 years with the McCormick Harvesting and Machine Company, Chicago; International Harvester Company, the United States Motor Company and the Maxwell-Briscoe Company, was made sales manager; Charles E. Stuart, formerly with the Michigan Buggy Company, was made assistant sales manager, and Stanley H. Twist was made advertising manager. Branches have been established at New York City, Atlanta, Ga., and on the Pacific Coast. Property was purchased at 63rd street and 56th avenue, Chicago, on which a steel and concrete factory building is now being erected which will have a production of 300 units a day, or 90,000 a year. This structure will cost \$150,000. It will be completed in about 60 days. The present Chicago factory is to be continued in operation until the new structure is ready

for occupancy, which will be early in April.

During the Chicago automobile show the company located a demonstration headquarters at 1470 Michigan boulevard, at which Smith Form-a-Truck units were displayed. This building has been leased for a long term and is now being adapted for the uses of the company. The first floor is given over to city show and sales rooms, and the rear portion will be a garage for demonstration machines. The second floor is being remodelled for the executive offices, which will be removed from the Adams Express building. The building is one of the most modern and desirable in the Chicago Automobile Row. The company will maintain its own sales department in Chicago.

The purpose of the company is to distribute the Smith Form-a-Truck units through its branches and agencies that are now, or will be later, located in all sections of the country, just as vehicles are sold by the manufacturers, but because of the very general use of Ford cars, and the utilization of used machines for freight carrying purposes, these agencies will be numerous. The company is now represented in practically every commercial centre of importance. It has organized an export department and has material contracts for a year.

The Smith Form-a-Truck units are carefully built with the best of materials and by experienced workmen. Wherever they have been used they have been found more than equal to expectation for economy and utility, and there is a number that have been in service for more than two years on the Pacific Coast. Many of these have been worked with as much as 50 per cent. overload and have endured very satisfactorily.

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#### **RHODE ISLAND TRUCK MEN OPPOSE TAX.**

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As had been expected, truck operators in Rhode Island have been appearing before committees of the legislature opposing proposed laws to increase the taxation on motor trucks. The state board of public roads takes the position that trucks do more damage to the roads than other vehicles and should pay a larger part of the cost. But the operators maintained that their vehicles are less destructive than horse drawn vehicles. The discussion will be continued for some time before the matter is submitted to the vote of the legislature.

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#### **TRUCK OWNERS ORGANIZE.**

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Truck owners of Los Angeles have organized a truck owners' exchange to which dealers in trucks and tires and truck operators are to be eligible for membership. The body will join the Merchants and Manufacturers' Association. One thing that the new organization is taking up is a campaign to secure the prompt payment by the state and city for work done by dump trucks in road construction. Work done several months ago has not yet been paid for they claim.

## FRENCH ARMY TRANSPORTS.

### Standard Equipment Adopted for Trucks After Long Service Experience.

Despite the extreme care taken to obtain experience with motor trucks for transport in the annual army manoeuvres in France, and the trials had extended over a period of nearly 10 years, the machines that were first utilized in the European war by the French were far from having what is now recognized as the standard equipment.

Directly following the declaration of war all trucks and pleasure cars were requisitioned without very much regard to their fitness for army use or the condition, so long as they were practicably operative. Thousands of machines were commandeered that were later turned back to the owners and replaced with new



Packard Three-Ton Truck with the Standard Equipment Provided for the Service of the French Army.

trucks as these were built or imported from this country.

The usage of the machines is exceptionally hard. Whatever the service required it must be done without regard to expense or consequences, yet there is desire to protect the trucks so far as is possible, and the vehicles that are now in use are equipped to what has been established, for the duration of the war, at least, as standard equipment.

This is shown in the accompanying illustration of a three-ton Packard chainless truck, which has 12-foot wheelbase and a frame 12 feet in back of the driver's seat. This machine is a type of several American makes that have been regarded as being very satisfactory for all purposes. As a guard for the radiator against coming into collision with other machines or obstacles, a special angle iron frame is built at the forward end of the frame, and a heavy angle iron bar, fitted on and cushioned by strong springs, serves as a bumper at the rear end of the frame.

The chassis is fitted with an acetylene gas tank and head lamps, special tool and spare part boxes and a hub odometer. The body is a box type that is built to specifications supplied by the army engineers, which is fitted with seven heavy bows that are covered with a water proof cover, and there is a tarpaulin apron that extends from the forward bow to the dash which protects the driver in the event of storm. The top and covers are quickly removable.

### BOSTON MEN STUDY TRAFFIC.

After several days spent in New York and other cities studying traffic matters, the Boston street commissioners have returned convinced that the proper handling of Boston traffic requires the creation of a trained traffic squad. After a study of the use of semaphores they came to the conclusion that the heavy permanent machine, such as was used on Tremont street in front of the Boston Common for some weeks, is the wrong type, and that what the city needs is a light, portable semaphore that can be removed easily from the street when it is not needed. They doubt the advisability of placing these semaphores at all crossings, but would put them in places where the traffic is most dense.

Inspector Meyers, in charge of traffic work in New York, promised the commission to visit Boston, investigate the situation and make recommendations regarding the handling of Boston traffic. Following his inquiry and

recommendation to the commission further amendment of ordinances of the city will probably be made.

### 150 TRUCKS SUNK IN HUDSON.

A float containing 150 motor trucks in shipping crates for England broke loose from its moorings in the North river at New York and drifted out into the stream. When tugs were hauling it back it sank in 30 feet of water. Floating derricks were then employed to lift the crated trucks from the bottom of the river.

### CAN'T LIMIT TEXAS TERRITORY.

A suit brought against the Olds Motor Works by the attorney general of Texas has been ended by the court issuing an injunction which prohibits the company limiting the activity of any dealer to a certain territory within the state. Dealers are free to compete with each other all over the state.

## REPUBLIC INTERNAL GEAR DRIVEN 3 1-2 TON TRUCK.

**F**OLLOWING the policy that has established it a potent factor in the motor truck industry, the Republic Motor Truck Company, Alma, Mich., has developed a three-ton load capacity machine that is constructed almost wholly of components built by best known manufacturers of the country, and through standardizing this vehicle has placed a market value on it that is regarded as extremely low when the quality and the character of construction are considered.

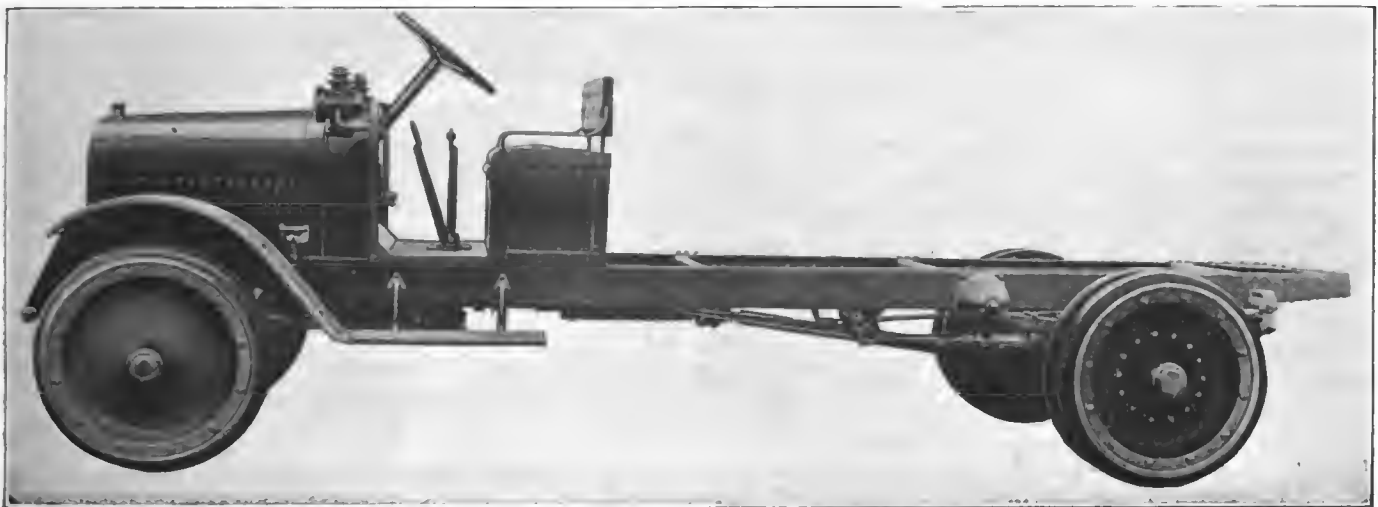
The Republic company originally built but one size machine, that having load capacity of 3000 pounds, but because of the demands for other sizes, it increased the size of this unit to 4000 pounds, and then built two smaller vehicles of 2000 and 1500 pounds capacities. It is now producing commercially a truck that, because of its design and the material from which it is constructed, is expected to be equally efficient and as sat-

isfactory in all services in which machines can be used. price has been established, this has been possible mainly from standardization and not through sacrifice of quality or workmanship.

The Republic three-ton truck is sold for \$2350, which is very low considering the size of the unit, but it has every practical service quality that operating experience has taught is desirable. The simplification of the design insures that adjustments and repair can be made with minimum labor, the provisions for lubrication are such that all moving parts are thoroughly oiled or greased, and careful attention has been directed toward protecting the mechanism from unnecessary or abnormal wear.

### Careful Test of Internal Gear Drive.

The company adopted the internal gear drive for the smallest truck that it built after careful investigation of the system in comparison with others, and after



Side View of the Republic Internal Gear Driven Truck Chassis, This Particular Machine Being Equipped with a Disc Type Steel Wheel—Wooden Wheels Are Optional.

isfactory in all services in which machines can be used.

The Republic company has been extremely successful from a business point of view, because it has never sought to experiment or adopt innovations. To the contrary, its machines have been constructed of units that have been developed to high efficiency by specialists. Nothing has been untried. Instead of building what would require systematic educational promotion, it has preferred to utilize components that have widely recognized qualities, and which will appeal to those who require substantial and economical machines.

### Units of Truck Well Tried.

Practically every unit included in Republic trucks has been perfected through years of service and by engineering organizations that have every facility and resource essential for development, and science and practical experience have been combined to produce what will have long endurance, operating economy, efficiency and simplicity. The materials have been very carefully selected and while a seemingly small market

experience with side chain power transmission. In making this choice the company was actuated solely by the purpose to obtain what would, in the mind of its engineers, be most economical for the owners. The belief was that the greatest degree of protection was absolutely essential, with such construction that comparatively little attention would be required.

The results obtained from the service of the fast, light weight machines were such that internal gear drive was adopted for the 2000 and 3000-pound trucks, and when the 6000-pound truck was decided on there were stronger reasons than ever before to justify the continuation of this system of power transmission in that vehicle.

### Has a Unit Power Plant.

The power plant is a unit type that includes the Buda engine, multiple disc clutch and the selective sliding gear transmission gearset, which is mounted under a hood, and the power is transmitted by shaft to the jackshaft of the Celfor rear axle. The unit is suspended at three points on the forward cross mem-



ber and the side members of the frame and protected against the stresses of chassis distortion. The engine is a four-cylinder, four-cycle, water cooled, vertical, L head type, that has a cylinder bore of  $4\frac{1}{4}$  inches and stroke of  $5\frac{1}{2}$  inches, and a horsepower rating of 28.9 by the S. A. E. formula. The bore to stroke ratio is 1:1.295, and the claim is made that the engine will develop in excess of 40 horsepower when driven to its maximum power production.

The cylinders are cast en bloc from a superior quality of gray iron with the water jackets integral and the water manifold included in the block. The head of the jacket of the cylinder block is cast open, this insuring that the water passages are thoroughly cleared and afford positive freedom to the circulation of the water in the cooling system. As the jackets are baffled the water, which enters the cylinders directly under the valves, circulates completely around each cylinder.

#### Large Water Jacket Head.

The head of the water jacket is a specially designed plate that includes the outlet manifold, and this is secured in place by a series of cap screws. This may be quickly removed for examination of, or cleaning, the water jackets. The base flange is wide and is very heavy on the valve side of the engine to afford seats for the valve tappet guides. There are wide webs at the ends and in the centre under the valve pockets, and on these are seated the cover plates that enclose the valve mechanism.

The rough castings are first subjected to water pressure tests and are then rough bored and aged, after which they are reamed and finished, and are tested by water pressure for the second time to insure against leaks and defects. The pistons are cast from the same material as the cylinder blocks and after being turned are carefully ground to size. They are channelled for four eccentric diagonally-split rings that are accurately machined and ground on the faces and sides to insure close fitting. The pistons are grooved to better distribute the oil and are drilled with relief holes to prevent excess oil reaching the combustion chambers and causing the engine smoking. The wristpin holes are

bored and reamed with much care to obtain the accurate alignment desired.

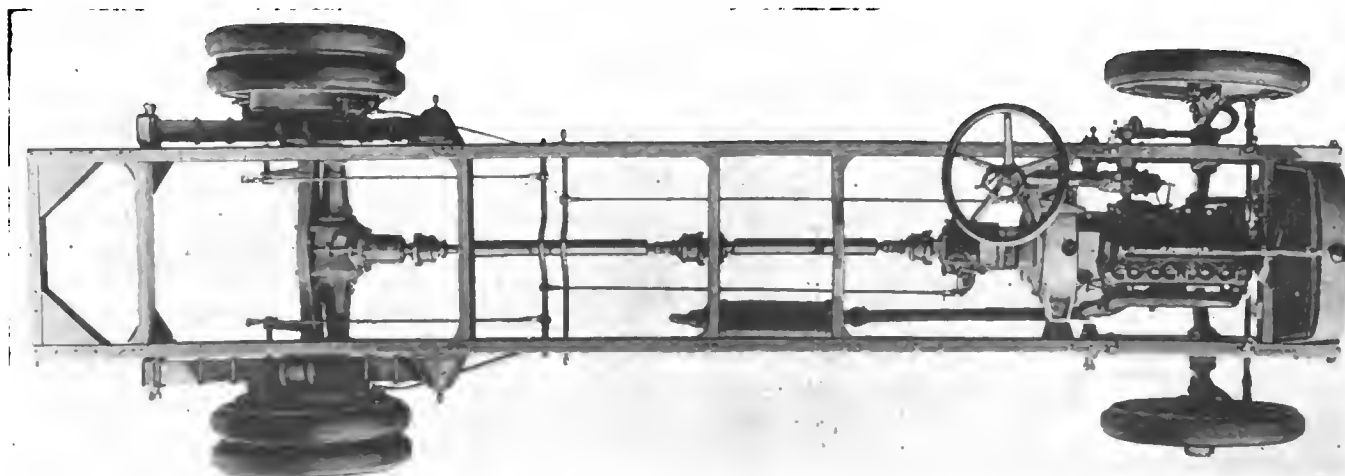
#### Crank Case in Two Sections.

The crank case is cast in two sections from a special aluminum alloy. The upper section is divided by a central vertical transverse web, which, with the ends, carry the main bearings. The lower part of the crank case is divided by a horizontal transverse web in which are the oil pits of the crank chamber, and below this is the oil reservoir. A forward extension of the crank case forms, with a cover plate, the housing for the timing gearset, and rear extensions form the bell housing, which encloses the flywheel, and to which the clutch and gearset housing is bolted. On the sides of the case are the bracket for the magneto and the lugs that support the sod pan. The unit is mounted on a trunnion on the forward end of the case that seats in a bracket on the front cross member of the frame, and arms cast integral with the flywheel housing support the rear end. The construction is such that the lower half of the crank case can be removed while the engine is in the chassis for examination of, or work on the connecting rod or main bearings.

#### Crankshaft and Connecting Rod.

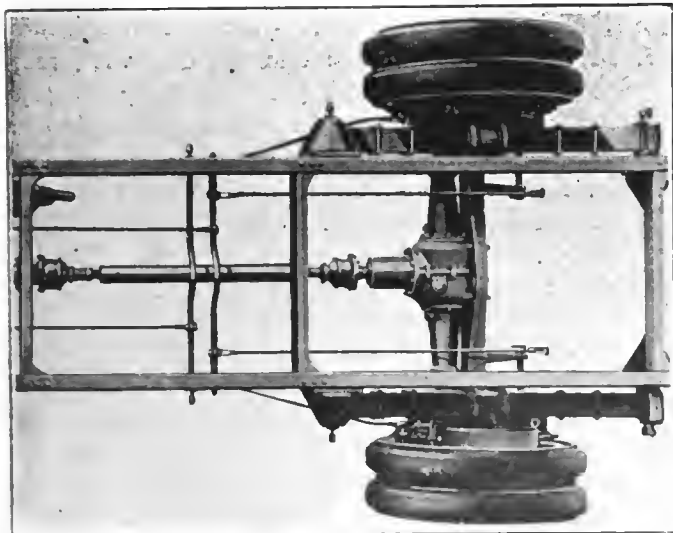
The crankshaft is drop forged from a high-grade of open hearth steel that is heat treated and machined carefully. This is balanced by testing in a special Norton crankshaft balancing machine. The flywheel flange is forged integral with the shaft. The shaft has a tensile strength of 120,000 pounds and an elastic limit of 85,000 pounds to the square inch. The shaft has three main bearings, that from front to rear are respectively  $1\frac{3}{4}$ , two and  $2\frac{1}{8}$  inches diameter, and in the same order are  $3\frac{1}{8}$ ,  $2\frac{1}{2}$  and four inches length respectively, there being a total main bearing length of  $9\frac{5}{8}$  inches. The connecting rod bearings are  $1\frac{7}{8}$  inches diameter and  $2\frac{3}{8}$  inches length.

The I section connecting rods are drop forged from open hearth steel and are heat treated. The machining is carefully done and the rods are reamed to obtain perfect centres and alignment, and care is taken to balance them. The rods are not offset. The large wrist-



Plan View of the Republic 3½-Ton Truck Chassis, Stripped of Seat, Floorboards, Dash and Hood, to Show the Unit Power Plant and the Transmission System.





Top of Rear End of Republic 3 1/4-Ton Chassis, Showing the Springs and Celfor Axle.

pins are made from open hearth steel and are case hardened and carefully ground and finished. The wristpins are secured stationary in the piston bosses by set screws that are locked.

#### The Camshaft and Bearings.

The camshaft is a single-piece type, it being drop forged from open hearth steel with the cams and flange for the timing gear integral. It is designed for three bearings. The shaft is machined and case hardened and the cams are ground on a special machine to obtain accuracy and correct contour. The cams are large and are designed to afford noiseless operation and long endurance.

The bearings of the crankshaft and the big ends of the connecting rods are nickel babbitt. The connecting rod bearings are mounted in the big ends with caps that are secured by four special steel alloy heat treated bolts. The small ends of the connecting rods are fitted with phosphor bronze bushings that are clamped in the rods. The bushings oscillate on the wristpins. The camshaft is mounted on three large phosphor bronze bearings.

#### The Valve Mechanism.

A crankshaft, a camshaft and a magneto and pump shaft gear make up the timing gearset. The gears have wide faces and they are helical cut, which insures quiet operation. The gearset is enclosed by a cover plate that may be easily and quickly removed for examination or work.

The interchangeable valves have nickel steel heads that are electrically welded to soft steel stems, the stem ends being hardened to endure the wear of the tappets. The valve ports are  $1\frac{7}{8}$  inches diameter and the valves have clearance that will afford thorough scavenging and sufficient charges of fresh fuel. The valves are operated by oil-tempered springs. The

valves are mounted in guides of liberal length. The valve tappets are of alloy steel and are a mushroom type. They are hardened and ground to accurate fit in the large guides mounted in the base flange. The tappets are adjustable by screws and lock nuts to compensate for wear of the valve stems. The chambers in which the valves are located may be enclosed by steel plates that are retained by thumb nuts and can be readily removed when desired.

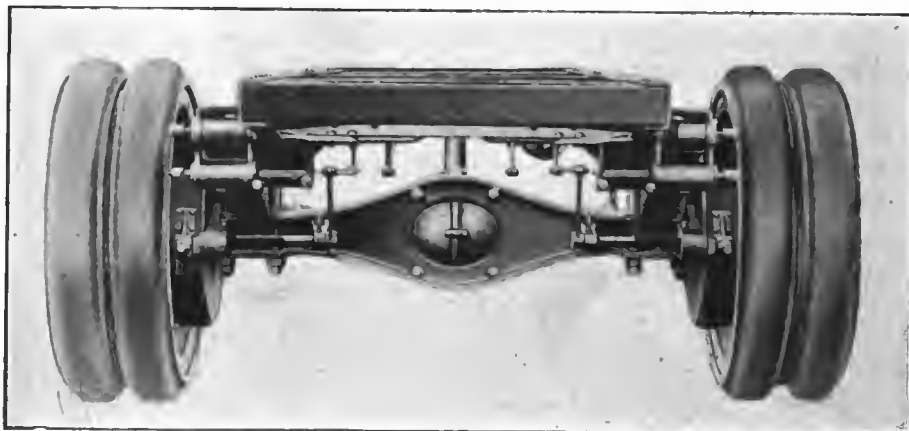
#### Lubricating and Cooling Systems.

A combination force feed and splash system affords thorough lubrication of the engine. The reservoir will hold five quarts of oil. The lubricant is drawn through the screen or filter surrounding the pump well in the reservoir by a gear driven pump, and is forced through tube to the main bearings and the timing gearset, which are flooded. The overflow is drained into the troughs in the base of the crank chamber and is distributed by splash to lubricate the cylinders, pistons, wristpins, connecting rods, camshaft, cams and valve tappets, and the excess oil from the crank chamber drains to the reservoir, where it is filtered and again used. The oil pump and the filtering screen may be removed from the engine case without removing other parts. An indicator that is located near the combination filler and breather shows the depth of oil in the reservoir at all times.

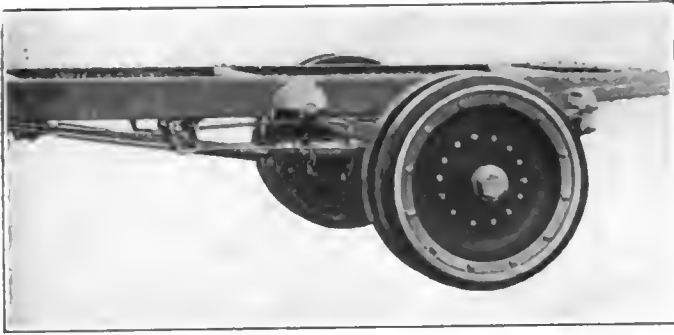
The engine is cooled by a circulation of water through the cylinder jackets and a large vertical tube radiator that is forced by a centrifugal pump that is driven by a gear and shaft from the timing gearset. The radiation is promoted by a fan of generous size, that is mounted on annular ball bearings on an adjustable bracket on the forward end of the cylinder block, that is driven by a flat belt from a pulley on the pump shaft. The system is stated to be exceedingly efficient.

The fuel is supplied through a Stromberg carburetor, this being an automatic float feed type, by gravity. The engine is controlled by a governor that is automatic in its action, the velocity of the fuel gas being the means of regulation. The ignition current is supplied by a high-tension magneto that has an adjustable advance.

The clutch is a dry multiple disc type that includes



Back Axle and Method of Spring Suspension of the Republic 3 1/4-Ton Truck, Driven by Internal Gears. Digitized by Google



No Radius Rods Are Used, the Drive, Following the European Practise, Being Through the Springs.

16 disc faces that are alternately saw steel and raybestos facing. The clutch is ample for all requirements and is said to be extremely efficient and easy of engagement. The transmission gearset is a selective sliding gear type having four forward speed ratios and reverse, the shafts and gears being of nickel steel. The gears have  $\frac{7}{8}$ -inch faces. The shafts of the gearset are mounted on annular ball bearings that are said to have capacity 50 per cent. in excess of any possible work they may be required to do.

The power is transmitted by a tubular shaft  $2\frac{1}{2}$  inches diameter, with  $\frac{3}{16}$ -inch wall, that is in two sections. From the main shaft of the gearset, where there is a large universal coupling, the first section extends through a bearing mounted on a substantial cross member of the chassis frame. Back of this there is a second universal joint and there is a third universal joint where the rear section is coupled to the pinion shaft of the rear axle. This construction insures against shaft whipping and a very small degree of shaft angularity.

#### The Celfor Internal Gear Rear Axle.

The Celfor rear axle is built with the jackshaft housing mounted ahead of the I section drop forged steel dead axle that carries the load. The I section is expanded in the centre to  $12\frac{3}{8}$  inches depth and the webs are two inches width. The axle is a half inch thick in the expanded centre. The wheel spindles are nickel steel and are brazed and pinned into sockets in the ends of the I section. The spindles are fitted with Hyatt roller and double-row annular ball bearings.

The brake flanges and covers for the internal gears are mounted on the axle and are secured to heavy lugs formed integral with the axle. The jackshaft, which is enclosed in a housing, is bolted to the I section in the centre, and the ends of the housing are carried in the spiders or flanges.

The drive from the shaft pinion is through a bevel gear and a differential gearset and shafts to spur pinions mounted on the ends of

the shafts that mesh with the internal gears secured to the drums mounted on the rear wheels. The reduction at the master bevel gear is 2.75:1, and the reduction through the spur pinions and the internal gears is 4:1. The spur pinions have  $1\frac{1}{2}$ -inch faces and are four pitch. The jackshaft and the differential assembly are fitted with Hyatt roller bearings, but with annular ball thrust bearings and a double-row annular ball bearing at the head of the pinion shaft.

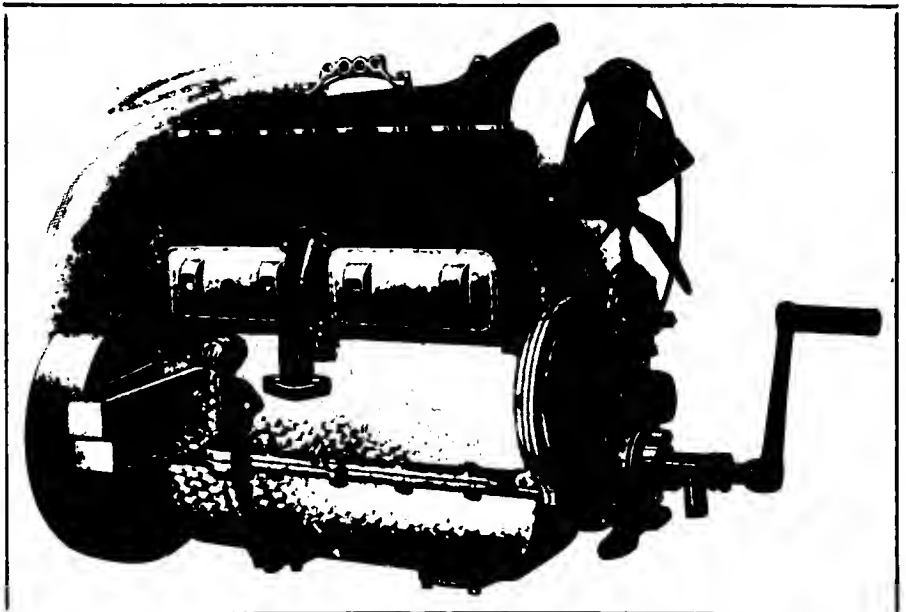
#### The Front Axle and Springs.

The front axle is a drop forged steel I section,  $3\frac{3}{8}$  inches deep and  $2\frac{1}{4}$  inches wide, with a web  $1\frac{1}{4}$  inches thick. The inside spindle diameter for the Bower roller bearings is  $2\frac{3}{8}$  inches and the outside spindle diameter is  $2\frac{5}{32}$  inches. The frame is a pressed steel channel section 240 inches length and 37 inches width, the side members being seven inches width, with  $2\frac{1}{2}$ -inch webs, made from  $\frac{1}{4}$ -inch metal. This has six heavy cross members that are heavily gusseted and riveted.

The frame is suspended on semi-elliptic springs of heat treated alloy steel, with all rear ends shackled. The front springs are 44 inches length and three inches width, and the rear springs are 52 inches length and four inches width. The front set has eight leaves and the rear set 13 leaves. The springs are mounted on seats forged integral with the axles. The forward ends of the rear springs are secured in heavy hangers outside of the frame, and the drive is through the springs, there being no radius rods. This construction follows the very general European practise.

#### Wheels, Steering Gear and Control.

The wheels are artillery type, of wood, with steel optional, the wood wheels having each 14 square spokes,  $2\frac{1}{2}$  inches square for the front wheels and  $3\frac{1}{2}$  inches square for the rear wheels. The front wheels are equipped with 37 by five-inch solid band tires, and



The Buda Long Stroke Engine That Is Combined with the Clutch and Transmission Gearset in a Unit Power Plant.

the rear wheels with 37 by five-inch dual band tires, the standard equipment being Firestone shoes. The wheelbase is 165 inches, with 185-inch wheelbase optional for an additional charge. The standard tread is 62 inches.

The steering gear is a worm and nut irreversible type, with heavy linkage carried behind the front axle. The control is by the usual clutch and service brake pedals and a throttle lever on the steering wheel. The driver's seat is at the left side, with the emergency brake and the gear shifting levers at the centre. The service brake is a double-acting type that contracts externally on the drums on the rear wheels, the bands being 20 inches diameter and three inches width. The emergency brake internal expanding shoes are 19¼ inches diameter and 2½ inches width and operate with the rear wheel drums.

The gasoline tank, 18 gallons capacity, is located beneath the driver's seat. The standard chassis equipment includes the driver's seat, cushion, front fenders, running boards, two oil dash and one oil tail lamp, tool kit, tool box and horn.

#### RANK BY NUMBER, NOT OUTPUT.

Massachusetts ranks sixth in the number of motor truck factories within its borders, but this rating is without relation to outputs or value of product. The state has 13 factories, Michigan 41, New York 37, Ohio 31, Pennsylvania 25 and Illinois 20.

#### MORELAND TRUCKS IN MILITARY TEST.

Four 2½-ton Moreland trucks with worm drive axles recently made a military demonstration run on the Pacific Coast, which was observed by army and militia officers. The trucks were driven 122 miles between Los Angeles and San Francisco, each truck carrying a gun crew and trailing a 3-inch modern gun with its caisson. Manoeuvres were made with the trucks on steep hills, through soft ploughed land and on rough, rocky trails. The trucks had ample power for every work and thoroughly convinced the United States army observers of their utility.

The trucks covered 268 miles on the round trip. The total cost for the run, including driver's pay, gasoline, oil, grease and kerosene, was \$40.92, a cost of about 3 4/5 cents per mile for each truck. The cost per ton-mile was about ¼ cent. These figures show a great economy over work of army mules.

#### BEARINGS BY TRUCK LOADS.

#### How Distribution of Hyatt Equipment Is Made at Detroit Factories.

Few persons realize the number or the cost of the bearings that are used in the construction of pleasure cars and trucks for the purpose of eliminating friction, the result being economy of fuel and lubricant and minimizing wear and the consequent repair expense. Machines could be built equally strong, but they would not be as enduring, while they would not only require greater attention, but the cost of maintenance would undoubtedly soar as compared with the upkeep of the average vehicle with improved journals.

The illustration accompanying this statement shows a large motor truck that is freighted with packing cases that contain approximately 16,000 pounds weight of Hyatt roller bearings, which range in sizes from about that of a small watch to that of a large alarm clock. There is enough bearings in the load to equip the rear axles of 2000 automobiles, and one of the Hyatt company's customers receives a load like this nearly every day.

One other truck like that shown is required to make the daily deliveries of Hyatt bearings to the automobile factories of Detroit, which gives some idea of the necessities of the industry throughout the country. A car load of bearings in boxes is received daily at the Hyatt warehouse in Detroit from the factory of the Hyatt Roller Bearing Company at Newark, N. J., and these are distributed direct.

The handling of the bearings from the time of shipment at the factory until they reach the customers minimizes time, obviates confusion and affords a service that can be depended upon at all times.



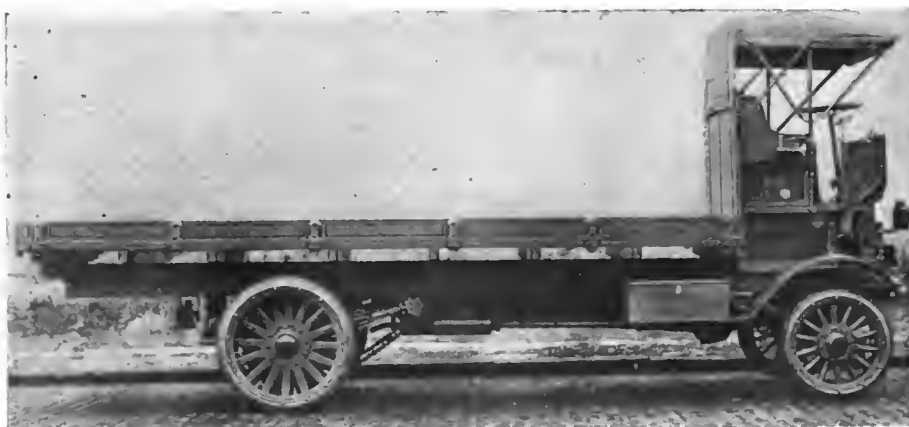
One of the Two Trucks That Carry 16,000 Pound Loads and Deliver Hyatt Roller Bearings to Detroit Automobile Factories.

### MOTOR AMBULANCES FOR HORSES.

Mrs. David Nevins of Methuen, Mass., a supporter of the Massachusetts Society for the Prevention of Cruelty to Animals, has presented that organization with an ambulance for sick and disabled horses which consists of a tractor made from a very short one-ton Garford truck chassis and a two-wheeled trailer in which the animals are carried.

The chassis is worm driven and the tractor is attached by a swivel connection which allows universal movement between the two. The floor of the trailer is inclined toward the rear, so that at the end it is quite near the ground. The end gate can be thrown down so that it may be utilized as an inclined platform up which the horse can walk if it is on its feet. If not, it is loaded on a rolling platform with its head strapped to a pillow and this pulled into the body by a winch at the front.

The body is equipped with a top and side curtains to afford protection in stormy weather. The opening at the front of the body is made in horseshoe shape. On



Mack Truck with Special Body Design for the Haulage of Cotton in Bales at Bombay, India.

each side of the exterior is a cast bronze medallion carrying the seal of the society.

The ambulance is to remain at the Garford show rooms in Boston until after the annual automobile show and will then be delivered.

It was built by the Monahan Vehicle Company of Providence, R. I.

### TRUCK OWNERS CAN USE CHEAP FUEL.

On the Pacific Coast there are 2500 trucks using a distillate fuel that is little better than kerosene and there are many trucks in Indiana also operated with this fuel which may be had for seven or eight cents a gallon. It has substantially as much power as gasoline.

The requirements are a carburetor specially designed to meet the conditions such as the Master carburetor, which is in use on most of the distillate trucks. Two tanks of fuel are carried—a good grade of gasoline in a small tank for starting the motor and burning

out the soot which is characteristic of kerosene, and the large distillate tank for regular service.

With judicious use it is possible to drive a truck from 8000 to 10,000 miles on the distillate without grinding the valves.

The high cost of gasoline has been forcing hundreds of users to adopt this method of utilizing low-grade fuel, while a number of truck manufacturers are preparing to turn out trucks ready equipped in this way for cheap oils.

### LOW PIERCE-ARROW DEPRECIATION.

After four years and a half of service, during which it covered 61,000 miles, the first Pierce-Arrow truck placed in service has just been sold by its owners for \$2000. The truck cost \$4500, so the annual depreciation during its four years of service was slightly more than 12 per cent., although the company, as is usual with most other users, wrote off depreciation upon it at 20 per cent. a year. The purchasers felt they got a great bargain when they acquired the used truck at \$2000.

This truck was used for heavy long distance hauling on the steep hills about Pittsburg. The rear tires were found to average 9000 miles, while front tires lasted for 13,000 miles. The repair expense for the 61,000 miles, including one complete overhauling, amounted to \$880.

This result is pointed to by the Pierce-Arrow Motor Car Company as showing that average depreciation allowances on high-grade trucks have been too high,

and that trucks are really much more economical to operate than appears from the usual methods of keeping truck costs. Few pieces of machinery submitted to anything like the hard usage a truck endures would show as low an annual depreciation as 12 per cent.

The Lane Motor Truck Company is being formed in Kalamazoo, Mich., with a capital stock of \$25,000. It is to produce a 1200 to 1500-pound truck with four styles of bodies, express, open flare board, stake body and stationary top body.

The McCullough Motor Supply Company of Minneapolis has opened branches in Chicago and Cleveland.

The Ohio Oil Company has purchased from a syndicate large operations in the Wyoming oil fields. It has shipped in drilling machinery and expects to exploit the field on a large scale.

## ACTUAL COST OF OPERATING MOTOR TRUCKS.

### The Greatest Accuracy Can Be Obtained with Service Records Figured on the Mileage Expense—Examples of Proven Data with Varying Types and Sizes.

**E**CONOMY is the reason that impels the business man to seriously consider motor trucks as a means of highway transportation. His attention may be directed toward trucks by the personal solicitation of a salesman, or by inquiry into the details of his own affairs that has at least suggested the possibilities of saving of time or labor and the money that either or both represent.

There are, of course, different conceptions of economies. For instances, there are those who maintain that elevators in buildings are an expense to the owners as compared with stairs, but they are believed to be necessary because of the fact that many structures are so equipped, and without them offices and apartments are not so easily rented and are not so productive. But without exception elevators are demanded by tenants and their customers, and as an investment they are amply justified.

There are those who assume the same attitude with reference to power wagons, maintaining that trucks are expensive as compared with other forms of highway transportation, but the people demand the service that can be given with no other type of conveyance, and the business men must satisfy their customers, even at some added expense.

#### Men Conceal Their Ignorance.

These statements are made to demonstrate that practical men resort to what may be termed nonsense to conceal their own ignorance. The average business man prides himself upon his knowledge of his own enterprise. He is not willing to concede that he has not grasped all the details, and yet there is hardly one man in 100 who can state precisely what his transportation is costing him.

No one realizes this fact as keenly as the transportation engineer, who has occasion to study different equipments and facilities and to estimate or learn of their value from the viewpoint of the owner. The man who succeeds with economies is undoubtedly well informed of the work, and the more intimate the knowledge the greater the results.

So far as transportation is concerned the subject is not complex, at least in the sense of research or what is not definitely known. Economy can be obtained by system, organization and supervision, and, of course, careful study of the factors that enter into it. But the business men have been, and are now as a rule, unwilling to give the time and attention to what they believe to be of secondary importance, and so trifling a factor that they will not consider it seriously.

#### Railroads Examples of Organization.

One has but to turn to the railroads as examples of the possibilities of organizing transportation. Sys-

tem and method have brought the development of these great properties, and without question the net earning of the railroads have resulted from the most careful comparisons of revenue and operating cost. By this is meant that the profits have been made by not raising the rates, but by increasing the efficiency of the units. The income has been measured in fractions represented by decimals and the average railroad official will demonstrate today that while tonnage has increased the cost of transportation has fallen. These facts could not be learned save by very careful study of records.

While the average business man will examine a trial balance with keen interest, were he to make analysis of each department and endeavor to make them all as productive as possible some surprising results would obtain.

#### The Animal Standard of Haulage.

With reference to highway transportation, the great mistake made by practically all is to measure by or regard as a standard the work that has been or can be done with animals. Considering a store, for example. The owner must make deliveries to his customers because his competitors deliver goods. He invests in such equipment as he believes will meet his requirement and accepts the limitations of the animal as governing him and his activities.

The buyer assumes he knows all that is necessary to know of horses and he can hire men to drive them whose capacity to even handle animals is extremely vague. As any person can assumedly drive a horse, there is no special fitness required so far as the animal is concerned, and carrying baskets or packages and occasionally taking orders is what any boy of ordinary intelligence can do without instruction or supervision. What has been stated can be applied to the man operating the corner store, but it will apply equally well to those who carry on business on much larger scale, and sometimes to very large enterprises. While every other department is given close supervision, the transportation—the haulage and delivery—is seldom thought of.

#### Delivery Is Always an Expense.

It is regarded as a certain expense because no revenue is received from it. It is supposed to be economically maintained if the cost is not greatly increased, and no thought is given to the possibilities of the department for advertising. No value is placed on the service, when as a matter of fact it may be very large. One of the very natural demands made by the business man upon the truck manufacturer or his selling representative is for figures that will demonstrate what is practical with motor vehicles.

Not one man of a thousand in business can produce accurate figures of what his own work is costing. He may know if it is in the form of a given sum for a stated period, or he may have an approximation of expense, but he will not have definite facts which can be analyzed. Occasionally, there are those who know the daily tonnage, but they do not know the cost of operating their vehicles, nor do they know whether or not they are as efficient as they could be with reasonable care and supervision.

#### Variables a Very Large Factor.

So many variables enter into transportation expense that figures that will apply in one locality cannot be used for the purposes of illustration with reference to any other section with anything like accuracy. They may serve as an approximation, but aside from that have no particular bearing. By this is meant that facilities for shipping and receiving, the railroad terminals and docks, the conditions for delivery, the state of the streets and highways, the wages paid, the topography of the community, the efficiency of the employees, the character of supervision and the policy of the owner, all have more or less influence, and each factor varies. Not only this, the equipment and the manner of maintenance also have bearing.

A careful representation of the factors and cost for a city like Pittsburg, where there are numerous heavy grades, most of which must be ascended with the vehicles loaded, could not be used as an example of haulage expense in a city like Detroit, which is very level. No two localities can be compared on a common basis of cost with fairness to the business men of either. In fact, it is doubtful whether a fair comparison could be made of two concerns doing the same kind of business, side by side, having the same territory to serve, with identical equipment, because the policies would differ somewhat and different men would be in charge of the work.

#### Can Fairly Compare the Work.

But it would be extremely logical to compare work done by two different forms of equipment operated by the same men and doing the same general work. Such a comparison would prove what would be possible, and from these statements economies could be developed that would no doubt be productive.

The majority of men believe that the economy of highway haulage ought to be measured by the cost of work done with horses because they are familiar with such work in a general way. That is, they assume that if they can hire a team, cart and driver, for instance, for

a given amount, and this outfit can be worked for a stated number of hours, that they have all the information that is needed on which to base judgment of transportation, and that their generally superfluous knowledge of how a work is done is sufficient to guide them.

#### Find Cost on a Mileage Basis.

Some of the concerns that have large transportation equipment and engage in haulage and delivery on large scales have kept very careful record, both of cost with horses and with motor trucks, and with these records economies have been worked out that are surprisingly large. With such companies the basis is generally the cost a mile for each vehicle, and when these are examined considerable variance will be found with two wagons and trucks that are doing practically the same work. There are reasons, no doubt, for these differences, and yet they cannot be represented save by a careful analysis of the service and the records. When a record covers a given period, for instance, it will sometimes include an abnormal cost as the result of an accident or a condition that is not to be expected in average service. Attention is drawn to this fact because of figures that will be shown.

One of the most interesting details that can be prepared in connection with the use of a motor truck is what is known as the service characteristics, which include the period of work and show what parts of it are devoted to moving time, idle time, loading time, unloading time, etc. A truck may be absent from the garage for 10 hours, but three hours may represent the actual time it is driven and the remaining seven hours may be divided into loading and unloading time, actual idle time and an allowance for meals.

#### Facts from Actual Records.

There is little probability of such data being obtained unless there is absolute record kept of the movement of the vehicle by some form of mechanical recorder, and for a sufficient period of time to insure that it can be depended upon to justify determinations. The following tabulation, which is summarized from a statement prepared by the Massachusetts Institute of Technology in connection with its vehicle research, shows some very interesting facts. While it is necessarily much abbreviated, it does include record of how the time of both gasoline and electric wagons and trucks was utilized in regular service.

In this statement the time is represented in hours and hundredths for the purpose of obtaining the exact ratio of the moving to the working hours. This table

TABLE NO. 1, SERVICE CHARACTERISTICS OF GASOLINE TRUCKS—LOAD CAPACITIES.

	500	500	2000	3000	3000	6000	6000	7000	8000	10,000	10,000	10,000	10,000	10,000
Trips a day .....	..	..	1	1	1	..	..	4	5	..	1	1	..	..
Miles a day .....	..	..	48.6	25	70	..	..	99.8	48	..	24	52	..	..
Delivery stops a trip .....	36	14	36	59	38	24	1	17	10	6	29	36	8	5
Working hours .....	3.60	2.80	9.20	5.81	7.28	8.70	3.50	22.3	12.52	3.70	10.27	12.22	8.53	5.24
Moving time, hours .....	1.50	2.32	4.00	2.30	4.60	3.78	1.03	9.0	6.60	1.47	2.27	4.97	5.10	3.23
Loading time .....	..	..	1.00	0.16	6.33	..	0.32	6.8	1.00	0.08	0.45	1.00	0.25	0.63
Unloading time .....	1.60	0.48	3.60	2.58	1.97	4.05	0.75	6.5	3.40	1.70	6.50	5.05	2.48	1.38
Meals .....	0.50	4.00	0.60	0.77	0.38	0.90	1.40	..	1.52	0.45	0.95	1.20	0.70	..
Total standing time .....	2.10	..	5.20	3.51	2.68	4.95	2.47	13.3	5.92	2.23	7.92	7.25	3.43	2.01
Ratio of moving to working hours ..	0.43	0.83	0.43	0.40	0.63	0.43	0.29	0.40	0.52	0.48	0.22	0.41	0.60	0.62
Average running speed .....	13.1	12.8	11.9	10.8	15.2	11.9	8.05	11.1	7.3	8.2	10.6	10.5	12.7	10.2
Average time of stop .....	2.7	2.1	6.0	2.6	3.1	10.1	..	22.9	20.4	17.0	13.5	8.4	18.5	16.5
Average stops a mile .....	1.8	2.1	0.73	2.4	0.55	0.54	0.13	0.17	1.0	0.5	1.2	0.7	0.10	0.15



relates to gasoline machines ranging in capacity from 500 to 10,000 pounds, and in differing services:

The main fact with reference to any one of the vehicles dealt with in this table can be ascertained by reference to the "Ratio of Moving to Working Hours," which will show that this ranged from .22 to .83 per cent. In this connection one will also note that the fastest average running speed was not made by the smallest and lightest machines, and that the vehicle that was driven fast did not have a much better showing in the ratio of moving to working hours than some of the larger and heavier trucks. One of the trucks, a 7000-pound capacity machine, was worked 22.3 hours a day, and as 13.3 hours was standing time, the ratio was but .40.

The actual moving time was nine hours exactly, so that the gain was in the length of time the vehicle was available for use rather than in especial efficiency. In contrast with this is the 500-pound machine that was worked by 2.80 hours and had a ratio of .83, which was due to the very liberal allowance made for meals.

The tabulation of the work done with electric wagons and trucks with the same factors is interesting, although it refers to a small number of vehicles, because the average of the ratio of moving to working hours is higher than of the gasoline machines and there is not so great variance in the work as shown by this factor.

TABLE NO. 2. SERVICE CHARACTERISTICS OF ELECTRIC TRUCKS—LOAD CAPACITIES.

	1500	1500	2000	4000	7000	10,000
Trips a day.....	1	1	1	1	1	1
Miles a day.....	38	33.3	33.3	33.3	33.3	33.3
Delivery stops a trip.....	40	45	60	25	16	16
Working hours.....	4.10	8.02	9.10	6.50	4.62	4.62
Moving time, hours.....	1.10	3.87	4.47	3.45	1.81	1.81
Loading time.....	1.20	...	...	0.33	0.12	0.12
Unloading.....	1.80	3.27	3.83	2.40	1.32	1.32
Meals.....	...	.88	.80	0.32	.77	.77
Total standing time.....	3.00	4.15	...	3.05	2.21	2.21
Ratio of moving to working hours.....	6.27	0.48	.49	0.56	0.45	0.45
Average running speed.....	16.4	9.8	7.4	6.4	10.3	10.3
Average time of stop.....	2.7	4.4	3.8	5.8	...	...
Average stops a mile.....	2.2	1.2	1.8	1.1	...	...

Examination of the tables with reference to the loading and unloading times for these machines will show that with but one exception much more time was required for taking off the freights than in putting it on the machines, which can be explained in part by the fact that loading is generally one operation, while unloading is usually done during a series of stops and more time would be required than if it were not distributed. This characteristic is pronounced throughout the tabulation and demonstrates very effectively how great a bearing on vehicle economy the time required for loading and unloading really is.

#### Handling Freight Is Costly.

Those who estimate cost of vehicle use assume that speed and load capacity make the motor truck superior to all other means of transportation, but neither of these factors can be materially productive unless there has been endeavor made to hasten the handling of the freights and to obtain greater use of the machines. Quick discharging bodies and bulk loading, usually by gravity, can greatly reduce the loading and unloading time, but these can only be utilized for certain freights.

Some of the loads must of necessity be handled slowly, but this would be true no matter what the type of vehicle used.

Statement has been made that the cost of haulage is still very largely measured by the work that can be done with horses, and while there is no recognized limitation so far as distance is concerned, 15 miles a day is believed to be all that an animal should be driven regularly, provided that its value and health are to be considered by the owner. This is the average maximum, one should understand. In the event of greater distances the animals cannot be worked constantly, or could be used with others.

#### No Reason to Overwork a Truck.

But horses are not driven further than is necessary, and there appears to be no good reason to assume that a truck should be driven far because it has the capacity, unless there is use for it, but in the event of need it can be worked just as efficiently for a long period as it can for an hour, and, when long distances are to be traversed the earning capacity increases with the length of the haul.

The cost for the horse is usually based on a day, the charge for hired animals, carts and drivers being usually stated for that period of time. When this is contrasted with the cost of a truck, which may also be paid for by the day, there may be supposition that in the course of a year conditions would probably be equalized. By this is meant that taking the average work for a given length of time the price a day is a reasonable basis, and yet this is not accurate.

First of all, loads are seldom the same in weight, and distances of haulage vary from day to day. If records of weights of loads and distances were kept there would be decided variance in the earnings and work performed. There would be some haulage that would be decidedly expensive and some that was very cheaply done—so small return being received from it in fact that there would be a question whether or not if known it would again be undertaken. But accepting the assumption of average cost a mile, this affords the owner a basis on which he can do work with a certainty of obtaining what will fairly compensate him for his investment.

#### The Value of the Mileage Cost.

Where capacity loads can be carried the ton and the ton-mile are units that are sometimes accepted by owners as best representing to them the work done, but the variance in weights and distances often preclude very accurate record with these factors. Decidedly the best determination is the cost a mile, which is obtained by dividing the total cost by the number of miles driven, this covering any given period.

The accompanying tabulation, which has been compiled from data that has been prepared by the Massachusetts Institute of Technology in its vehicle research, can be regarded as accurate and dependable. In fact it may be stated to be the most comprehensive work of the kind that has ever been undertaken. This deals with the cost of use of different type machines

in regular work for varying lengths of time, but in most instances covering thousands of miles.

For the purpose of simplification the items have been minimized in number and while they include everything that could be regarded as normal expense, they in the majority of instances also cover repairs, overhauls, tire renewals, and, so far as possible, every detail of overhead, this item being made up of the expense charged for depreciation, interest, insurance and administration. The item garage and labor includes the cost of garaging and incidental labor, whether this be in a public or a private garage. Each individual record is of a machine that was worked consistently and with the supposition that it ought to be profitable to the owner, there was reasonably good supervision and careful record. Statement may be made that good business policy ought to credit the machines with the amount of the depreciation charged against them, which would in a number of instances considerably reduce the cost a mile, for the average was 20 per cent. a year, and some owners placed even more than that percentage against their machines.

This series of comparison has been divided into groups for convenience as follows:

#### GASOLINE VEHICLES LOAD CAPACITY, POUNDS.

	3000	3000	4000	6000	6000
Period, months....	12	12	8	3 1/2	47
Mileage .....	8316	8315	10,600	6850	5670
Gasoline .....	\$291.06	\$207.87	\$283.50	\$239.75	\$192.78
Lubricants .....	84	45	63	26	32
Tires .....	416	249	281	286	289
Repairs .....	100	123	75	163	168
Garage and labor..	221	259	240	123	137
Sundries .....	67	35	15	7	23
Driver .....	576	1243	755	1095	770
Overhead .....	608	534	972	1028	705
Total .....	\$2363.06	\$2695.87	\$2684.50	\$2967.75	\$2316.75
Cost a mile.....	\$0.28.41	\$0.32.18	\$0.25.56	\$0.43.32	\$0.40.86

#### GASOLINE VEHICLES LOAD CAPACITY, POUNDS.

	10,000	10,000	10,000	10,000	10,000	10,000
Period, months....	12	12 1/2	3 1/2	6	6	12
Mileage .....	6925	13,520	13,300	15,325	13,040	5728
Gasoline .....	\$651.67	\$554.32	\$881.30	\$670.34	\$599.64	\$234.84
Lubricants .....	101	49	36	66	55	85
Tires .....	554	825	990	762	652	292
Repairs .....	706	522	115	667	116	59
Garage and labor..	385	147	127	480	440	926
Sundries .....	49	22	61	18	14	....
Driver .....	311	1568	1708	962	885	....
Overhead .....	672	1227	1155	2240	1420	1249
Total .....	\$3435.87	\$3914.32	\$4003.30	\$6465.34	\$4081.84	\$2944.84
Cost a mile.....	\$0.49.61	\$0.28.95	\$0.30.10	\$0.42.43	\$0.31.30	\$0.51.40

#### GASOLINE VEHICLES LOAD CAPACITY, POUNDS.

	500	750	1000	1500	1500
Period, months....	12	12	8	30	30
Mileage .....	12,815	3000	5400	8050	8470
Gasoline .....	\$205.51	\$52	\$118.80	\$177.10	\$219.22
Lubricants .....	42	6	32.40	3	3
Tires .....	256	50	32.40	322	332
Repairs .....	197	51	194.40	296	199
Garage and labor..	189	..	275	120	120
Sundries .....	60	24	49	..	..
Driver .....	781	..	..	780	780
Overhead .....	231	110	219	537	537
Total .....	\$1961.51	\$293	\$921	\$2265.10	\$2190.22
Cost a mile.....	\$0.15.31	\$0.9.76	\$0.17.05	\$0.28.13	\$0.25.85

#### GASOLINE VEHICLES LOAD CAPACITY, POUNDS.

	2000	2000	3000	3000	3000
Period, months....	12	12	12	15	23
Mileage .....	10,137	10,650	9096	9880	12,060
Gasoline .....	\$425.75	\$447.30	\$272.88	\$207.48	\$277.38
Lubricants .....	..	..	90.96	36	23
Tires .....	220	381	273	434	241
Repairs .....	683	494	322	281	238
Garage and labor..	184	180	198	279	184
Sundries .....	46	46	71	..	..
Driver .....	872	838	703	..	1441
Overhead .....	687	675	543	222	195
Total .....	\$3117.75	\$3061.30	\$2473.84	\$1259.48	\$2599.28
Cost a mile.....	\$0.30.78	\$0.28.74	\$0.27.19	..	\$0.17.10

If there is a criticism to be made of the figures, it is the fact that the items were not all uniformly kept and for that reason in several instances there are omissions, such as the wages of the driver, for instance. But this is a value that could be supplied with sufficient accuracy for the information of any person who desired to make use of them. The machines were housed in private and public garages and they were given, in the majority of instances at least, good care and attention.

#### How the Trucks Were Used.

The services were reasonably diversified and from these the reader can obtain a very satisfactory idea of the cost of general operation. Reading the records of the vehicles in the order in which they are shown in the tables the first was in the service of a telephone company and was used in a section where the roads were excellent and the country rolling. The second, which shows very great economy, was used for the sale of butter and eggs and was driven by the owner, who made no charge for wages or for care, he caring for the machine himself.

The third was used by a gas company in the installation of meters and was equipped with solid tires. The fourth and fifth were operated by a wholesale drug house on roads that were good in a rolling country. The sixth, seventh and eighth vehicles were in the service of a telephone company where the road was excellent and the country rolling. The ninth and 10th were owned by department stores and were used respectively for parcel and heavy delivery, the former in a rolling country on fine roads and the other on fair roads and on hills. The 11th and 12th

were in the service of a telephone company, and the roads were very good, without steep grades. The 13th was utilized for delivery by a manufacturer of rope. The 14th and 15th were used by a wholesale packer for distribution where the roads were good and the country flat. The 16th was included in the equipment of a telephone company, the roads being very good and the country rolling. The 17th and 18th were in the service of a tannery where the roads were good, but hilly. The 19th and 20th were used for coal delivery on excellent roads in a rolling country, and the 21st was part of the equipment of a material contractor.

In this summary one will note that all of the machines had practical service, as was demonstrated by the mileage, and that some of the periods covered considerably more than a year.

C. H. Williams has been made manager of the Goodyear Tire and Rubber Company's branch in Chicago. He was formerly in charge of the branch at Portland, Me., where he is succeeded by J. A. Leatherman.

### KISSELKAR TRUCK COSTS.

A user of KisselKar trucks has furnished the maker with the following account of his truck costs and the amount of work he is able to accomplish with the truck:

Averaging costs for a year this company found that a four-ton KisselKar truck required for gasoline, oil, tires, repairs, including all new parts used, \$2.68 per day for 300 working days. A driver and helper are employed on each truck and this adds \$5 a day to the expense. Depreciation is figured at 15 per cent. of the present inventory value of the truck, or about \$1 per day. This makes the total cost per day's operation \$8.68. Four loads of four tons each are delivered every day within a radius of five miles, which gives a delivery charge of 55 cents a ton.

Five years ago this company was using 24 horses and one KisselKar truck. Today it has the four-ton, a five-ton, two-ton and one-ton trucks and four horses. Eighty per cent. of the orders are accompanied by a request for truck delivery. The experience of the company is that a horse team with two good horses would at most deliver only six tons in a day at a cost of \$5. So the saving effected by the trucks is very marked, in addition to their advertising value, capacity to cover greater territory and expand business done, and to work over time if necessary. They are used to compete with the railroads on even terms when the fact is considered that they take the load direct from the shipper to the receiver without intermediate hauling.

### MILITIA TO HAVE TRUCKS.

Major-General John F. O'Ryan of the New York State National Guard has authorized a plan to organize four motor truck companies which will require 28 motor trucks, costing from \$2500 to \$3000 each. A moving picture company has offered to lend the National Guard some educational pictures for the purpose of educating the public to the necessity for trucks. The pictures will be shown and the money received from admissions will be used to buy the trucks.

### DECLINE IN CALIFORNIA OIL.

Production of oil in California during 1915 declined 14,000,000 barrels as compared to the production of 1914, according to statistics compiled by the Standard Oil Company of California. Total stocks of crude were 57,147,051 barrels, as against 58,526,274 at the close of 1914.

The McGraw Tire and Rubber Company, East Palestine, O., has placed on the market a new S. A. E. standard American type truck tire in addition to its high profile European type. For the 1916 season the company's pneumatic tires will have white walls and black tread.

### CONNECTICUT TRUCK REGISTRATION.

Merchants in Connecticut are nervous because trucks from other states which deliver goods sold across the state line do not have to pay a Connecticut registration fee if they are registered in the state where they are owned. This situation was established by an opinion of the attorney-general five years ago. Since that time there have been changes in the automobile law, but the present attorney-general has given an opinion that this has not altered the situation. The matter is likely to come up at the next session of the legislature.

### HOLDEN JOINS SERVICE COMPANY.

The sales department of the Service Motor Truck Company, Wabash, Ind., has been augmented by Arthur E. Holden, who has been made assistant manager of the division. Mr. Holden, while a young man, has had a very broad experience and is very generally known throughout the industry. For more than five years he was in charge of the advertising and the sales departments for the Double Fabric Tire Company, where his endeavors were particularly energetic and unusually productive. Before he served in that capacity he was associated with the McIntyre Automobile Company, Auburn, Ind., being a member of the selling force. Being directly connected with the industry, for so long a period, Mr. Holden is generally familiar with marketing conditions throughout the country, and is personally known to a very large number who are active in the trade.



Arthur E. Holden, Assistant Sales Manager, Service Motor Truck Company.

### MIDVALE COMPANY BUYS CAMBRIA.

The Midvale Steel and Ordnance Company of Philadelphia has purchased the Cambria Steel Company and will issue \$75,000,000 worth of new securities to finance the purchase. The Midvale company is a large maker of steel for motor car and truck manufacturers.

A technical change is to be made in the articles of incorporation of the Vacuum Oil Company which will permit the company to own and operate a fleet of tank ships and permit it also to manufacture containers for its oil.

## TRUCK AND GARAGE EQUIPMENT.

### KWIK-LITE FLASHLIGHTS.

Kwik-Lite electric flashlights are made in a wide variety of styles and sizes, and include types ranging from fiber to metal in nickel, statuary bronze, gun metal, silver and gold finishing. The two designs shown herewith are the Kwik-Lite metal tubular flashlight and the Kwik-Lite metal vest pocket flashlight.

The metal tubular flashlights are non-short-circuiting. The cases are strongly made, from the best of materials. They are made in two parts—each being drawn into shape from a solid sheet of brass—the upper piece telescoping the lower, and securely joined by means of screw threads. This gives maximum strength and harmony in line. It is easy to insert the battery, which is done by merely unscrewing the two parts.

The possibility of short-circuiting the battery through contact with other metal objects is eliminated, as improved methods of insulation have been provided. The reflectors are scientifically designed to project an intense ray of light.

The Kwik-Lite metal vest pocket flashlights have cases of the latest design. There are no hinges or clasps on the entire case, thus eliminating all danger of torn pockets. They are exceptionally attractive. Like the above mentioned Kwik-Lites, the vest pocket type is also drawn from a solid sheet of metal. The lower part telescopes over the upper and when pushed together the parts lock firmly. With a slight pressure on the side of the case, the two pieces can be pulled apart, making it easy to insert the battery. The vest pocket models are supplied in the same attractive finishes as the metal tubular ones.

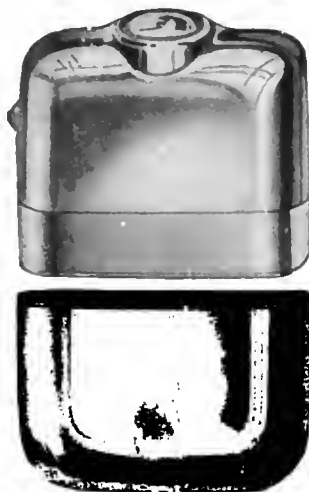
Manufactured by the Usona Manufacturing Company, 1 Hudson street, New York City. Prices quoted on request.

### AUTO REPAIR COASTER.

The outstanding feature of the Foster "Ideal" auto repair coaster is that comfort is afforded the workman regardless of the limited space in which he may be working. It is made with a strong angle iron frame from which a high-grade link fabric spring is suspended. This is covered by a full length cushion and head rest. The frame is re-enforced at the corners by heavy castings, forming rounded corners. These castings insure durability. They extend from the corners about six inches both ways under the angle iron of the frame. With the casters, these castings are securely riveted to the frame by six large rivets.

The pad and pillow are filled with a fine, soft cotton and are covered with a heavy black oil cloth. With each coaster is supplied a movable cast iron small parts holder, which can be readily hung from any position on the side rails.

The coaster operates very easily. The manufacturer declares that due to the strong metallic construction, it is virtually unbreakable and will last a life-



time. It is clean, sanitary and comfortable. The finish is in black japan, which is baked on.

Manufactured by the Foster Brothers Manufacturing Company, St. Louis, Mo., and Utica, N. Y. List price, \$2.50 with pillow only, and \$3.75 when equipped with pillow and pad.

### NEW SPLITDORF PLUGS.

The well known line of Splitdorf Common Sense spark plugs has been increased by the recent addition of the Metz Special and Heavy Hex types.

The Metz Special has a core of high grade, imported mica, wound lateral on a taper steel central electrode, the upper part of which is protected by a hexagon porcelain cap. The sparking points are composed of 98 per cent. pure nickel and they are made extra heavy. The steel shell is  $\frac{7}{8}$ -inch in diameter; the threaded part is standard  $\frac{1}{2}$ -inch pipe, extended one inch.

The steel shell of the Heavy Hex type is  $1\frac{1}{4}$  inches in diameter and the thread is standard S. A. E.  $\frac{7}{8}$ x18, one inch long and fitted with a copper asbestos gasket.

Manufactured by the Splitdorf Electrical Company, 98 Warren street, Newark, N. J. Prices and further descriptive matter will be supplied upon request.

### JUSTRITE FIRE EXTINGUISHER.

The Justrite chemical fire extinguisher is guaranteed to extinguish all fire, regardless of origin. It is a seamless brass tubing,  $19\frac{1}{2}$  by  $2\frac{1}{2}$  inches. It has capacity for one quart of Justrite fluid, which is discharged by a small crank, located at the bottom of the tube, that operates in a clock wise direction. The pumping mechanism is absolutely mechanical and the parts are warranted to be non-corroding if only Justrite fluid is used. Statement is made that by turning the crank at a high speed it is possible to develop a pressure equivalent to 300 pounds to the square inch. This makes it possible to cast a stream a distance of from 25 to 30 feet. A soft wire seals the crank and safeguards the machine against tampering. The amount of fluid in the extinguisher is shown by an indicator.



Justrite fluid is harmless to machinery and the most delicate of fabrics. It is a non-conductor and is, therefore, safe to use for all electrical fires. It is said that one quart of this fluid will generate several thousand feet of fire killing gas, which is about five times as heavy as air.

Manufactured by the Justrite Manufacturing Company, Clinton and Van Buren streets, Chicago, Ill. List price of polished extinguisher, \$7; nicked plated type, \$8.

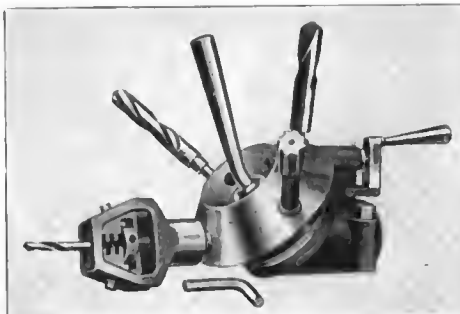
#### GLOBE TOOL SHARPENER.

In the Globe tool sharpener the grinder head is suspended from the top of the globe shaped casing and both are designed to swivel on a vertical axis. It can be clamped in any desired position. This feature enables the operator to turn the grinding wheel so as to obtain the most favorable light upon the work. The lower bowl is filled with water and serves the double purpose of collecting dust and providing a supply of water in which to dip the tools if they become too hot. The water does not touch the grinding wheels. A disc shaped and bevel shaped wheel accompany each machine. The former has a flat top rest that can be set exactly square with the sides of the wheel. There is a narrow swiveling rest for the latter for use with common tool grinding. Each wheel is mounted on a detachable iron centre that is screwed by one hand on one of the tapered ends of the spindle.

Manufactured by the O. S. Walker Company, Worcester, Mass. Retail price for complete equipment, including two wheels and a countershaft, \$50.

#### MULTIPLE ROTARY CHUCK.

Repair shops and service stations doing considerable lathe work will no doubt be able to reduce the cost of production by the use of the multiple rotary chuck illustrated herewith. It is designed to convert the ordinary lathe into a turret lathe. The device attaches to the outer spindle of the tailstock and can be attached or detached in about 15 seconds.



With this arrangement it is possible to drill, counterbore, ream and tap work without changing tools. The centre is located automatically for each tool.

The equipment is very substantial and accurate and is adapted for drilling holes up to 1½ inches in diameter. It is seven inches in diameter and weighs 27 pounds. Reliable parties may, if desired, obtain a 30-day free trial of the tool. Complete instructions for attaching the chuck to the tallstock sleeve accompanies each tool sold.

Manufactured by the Newman Manufacturing Company, 717-21 Sycamore street, Cincinnati, O.

#### LIPMAN PORTABLE GARAGE PUMP.

The model P4 Lipman portable garage pump, illustrated herewith, is of the four-cylinder type and is operated from an electric motor by enclosed gearing running in graphite and oil. The compressor is air cooled. It has 15 feet of high-grade air hose, fitted with a pressure gauge, and a Lipman patent pressure relief valve by which to read the tire pressure. The hose connects direct to the condenser, which is cast integral with the frame. A heavy flexible cable with detachable plug is fastened to the electric motor for connection with a lamp socket.

The motor can be supplied for any standard voltage and for either alternating or direct current. The pump can be furnished with water cooling chambers for use in filling air tanks having a pressure capacity up to 250 pounds.

The body and gear are finished in light gray enamel, while the pump, motor, wheels and handle are black enamel. The manufacturer estimates that the ordinary cost of operating this device for inflating tires is about 1/10 of a cent. A nationally advertised outfit of high quality. Write for literature and trade prices.

Manufactured by the Lipman Air Appliance Company, 199 Pleasant street, Beloit, Wis. Price will be sent to bona fide inquirers.

#### SEARCHLIGHT CONNECTION.

With the manifold connection shown in the accompanying illustration, four common automobile acetylene tanks can be connected, to be used in conjunction with an oxygen tank for welding purposes. It can be attached to any make of automobile acetylene cylinder. The manifold is connected to four cylinders of equal size and the regulator of the welding outfit is attached as shown. When the valves are open the operator can accomplish any work requiring a maximum of 150 to 200 cubic feet of gas, which is consumed at a rate not exceeding 25 feet per hour. This is very efficient garage equipment and makes for large profits on repair work.

Manufactured by the Searchlight Company, Chicago, Ill. List price, \$4; trade discount sent upon request.



### HIGH GASOLINE HAS COST \$50,000,000.

The increase in the price of gasoline during the past few months has already increased the receipts of the oil companies by \$50,000,000. The marketed production of crude oil is estimated at 267,500,000 barrels. Figuring 21 per cent. as the amount of gasoline refined from this raw material the gasoline production of the year would have been 56,154,000. The United States geological survey recently estimated 41,600,000 barrels as the actual gasoline production. While this amount was being disposed of the price level has advanced about 11 cents.

### FIRE CO-OPERATION IN THE COUNTRY.

The speed and range of operation of modern motor fire apparatus is bringing about in New Jersey co-operative associations of fire companies, arranged to support each other in combating bad fires and affording protection to country districts that have hitherto been without it. Fire companies in Burlington, Camden and Gloucester counties have formed a co-operative association. They are arranging the entire district so that some companies will respond to fires in any part of it.

### PREMIER TO MAKE MAIS TRUCKS.

The Mais Motor Truck Company of Indianapolis has been purchased by the Premier Motor Corporation and Mais trucks will be made by that concern in the future. The Mais was the first American internal drive truck. It has been built in Indianapolis for six years. Its example has been very effective in American truck development and great numbers of internal gear drive trucks are now in use. The trucks are fitted with a car speed type of governor. They have given excellent service in the hands of users.

### GENERAL PURPOSE TRACTOR.

The Opsata Motor Plow Company, Eau Claire, Wis., has prepared to begin production of a machine that may be used for plowing or for such general purposes as tractors are ordinarily utilized. The company has completed a factory and has also developed a new type machine that is said to be markedly superior to those formerly built, which will shortly be ready for the market.

### IS COLUMBIA TRUCK SELLING AGENT.

The L. G. Schoepflin Company has taken over the representation of the Columbia truck for the entire United States and will begin its selling campaign at once. The move divorces the selling and manufacturing divisions of the Columbia Truck and Tractor Company of Pontiac.

### TO FINANCE FARMERS PURCHASES.

A farmers' co-operative credit union through which it will be possible for farmers to pay cash for their purchases of mechanical transport or any other necessity or utility has been formed in North Carolina under a law passed by the state legislature in 1915.

One year loans are made to farmers at six per cent. interest with property or character as security. The union began business Jan. 20. About 100 members in the vicinity have pooled their interests in the society, which is known as Lowe's Grove Credit Union.

This credit union lends money to members at six per cent. on property. Private banks have been charging from eight to 70 per cent. Tenant farmers can get loans at six per cent. on a crop lien if the latter is signed by the land owner. He can then buy for cash, making a saving of from 40 to 50 per cent. under the old system.

The society lends only to members, but it receives deposits from any one and pays four per cent. interest upon them. The capital of the society consists of payments for shares. Membership in the organization costs only 25 cents. This is the first thoroughly modern rural credit union to be established in the United States.

### 91 MAKES OF WORM DRIVE TRUCKS.

A recent canvas of the 157 makers of motor trucks in the United States showed that three-fifths, or 91, are building models with worm drive rear axles. This is remarkable in view of the fact that three years ago practically the only drive used in the commercial vehicle field was chains. The Timken-Detroit Axle Company, which has been making worm drive axles for several years, has carried on a very active propaganda for worm drive whether or not the axle used was built by it.

### GARFORD'S MOST SUCCESSFUL YEAR.

The past year has been the most successful in the history of the Garford Motor Truck Company of Lima, O., according to a statement submitted to the stockholders at the annual meeting, Feb. 10, when the following officers were elected: President and general manager, E. A. Williams; vice president, J. M. Garver; secretary, J. M. Imler; treasurer, I. A. Stull. Two new buildings have been erected during the year.

### S. A. E. MID-SUMMER MEETING.

The annual mid-summer meeting of the Society of Automobile Engineers will take the form of a four-day excursion on the steamer "Noronic," leaving Detroit the afternoon of Monday, June 12, and returning Friday afternoon, June 16. Accommodation for over 500 members will be provided. The trip will again include points on Lake Huron and Georgian bay.



## VIM MOTOR TRUCK COMPANY'S \$1,000,000 PLANT.

**E**VEN those who are familiar with the extremely rapid growth within the past two years of the motor truck industry are surprised at the really wonderful progression of the Vim Motor Truck Company, Philadelphia, Penn., which is maintained to be the largest producer of light delivery wagons in the world. The company is about to occupy its new plant which will, when worked to its capacity eight hours a day, have a production of 30,000 machines a year. This is many thousands more than any other concern is now producing. By adding new shifts of workers the factory can be made to have even greater production.

The Vim company has apparently been constantly expanding, for in two years it made no less than nine additions to existing factory structures, there being now three separate divisions or plants constituting the manufacturing property of the company. The development has been continuous, but in the occupancy of the new building, which will cost approximately \$1,000,000, there is reason to believe that all demands for manufacturing space for a considerable time to come will be met.

This remarkable increase of facilities and equipment is the most substantial evidence of the practically universal

sale of Vim machines, which is built with a single type of chassis. The design was standardized after careful investigation and experiment, and there was abundant ground for belief that this would be a unit that would appeal to the greatest number of small business men, or those who have need for light machines, with ample power and capacity and suited to practically all purposes.

The chassis are constructed with unusual factors of safety and are intended to endure in all operating conditions. They are equally well adapted to all work where the load does not much exceed 1000 pounds, and the design is extremely simplified and unusually accessible. This is much desired, especially in the comparatively small machine which may be given attention by the owner or the driver. Economy of operation was the intention of the designer, and the statement

is made that unusually satisfactory results have been obtained.

The company has a selling organization throughout the country that has been successful beyond the hopes of the officials of the company and this is constantly being added to and improved that the business shall be attracted and retained. The company has been augmented by the association with it of T. H. Cathcart, formerly in charge of the Rudge-Whitworth wheel department of the Standard Roller Bearing Company of Philadelphia; W. L. Kroneberger, who was with the Curtis Publishing Company, and Howard Hewitt, formerly factory service manager for the Morgan-Dean-Rapley Company of Hamilton, Ont.

The distribution of Vim trucks in New England is directed by C. E. Wheeler, 68 Brookline avenue,



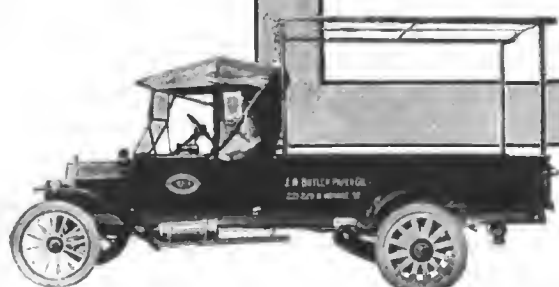
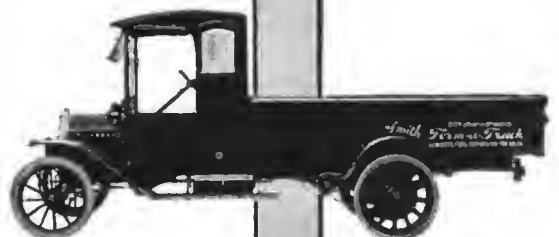
Vim Motor Truck Chassis, Load Capacity 1000 Pounds, Equipped with an Enclosed Body, Known as the Model De Luxe, Having Double Rear Doors.

Brookline, Mass., who has been associated with the company for a considerable period. He has been particularly successful. During the Boston show the exhibit of Vim chassis and complete machines made at Mechanics' building, at spaces 227-228, will be in charge of Mr. Greenwood. The display will include several handsome types of standard bodies that are built as regular equipment for the chassis. The exhibit will be prominent in the department devoted to trucks and it will undoubtedly attract many who are convinced that the light delivery unit affords the most satisfactory economy.

R. H. Macy & Co., New York City, has placed an order for 31 1½-ton Mack trucks with the International Motor Company. This followed an order for 12 similar trucks which was placed some months ago.

# Announcement to DEALERS

A few of  
the many  
Form-a-  
Trucks  
now in  
actual  
use.



WHAT IS UNQUESTIONABLY THE biggest money making opportunity ever offered dealers is now within your easy reach and, if you act quickly, you can secure an exclusive contract for your territory with full protection.

THE SMITH FORM-A-TRUCK IS NOT AN experiment nor a makeshift. It is a time tried and proven proposition. Over \$3,000,000 worth have already been sold. The truck is in daily use everywhere, and is selling like wildfire.

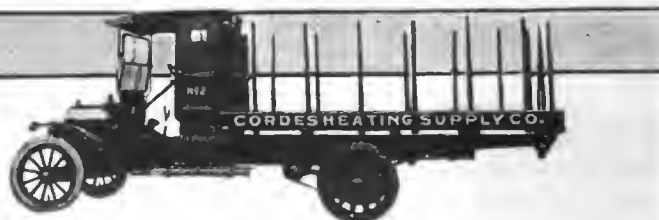
THINK OF THE MONEY YOU CAN MAKE as exclusive dealer for this sensational new invention. Just figure the big number of Ford owners in your territory—then think of the vast number of users for this attachment.

## The *Smith Form-a-Truck*

will convert an old or new Ford into the most economical and durable one-ton truck that can be made—and at half the price of any other one-ton truck. Highest quality materials used thru out. Think of it—real truck wheels, solid rear tires, chain drive, 125-inch wheelbase, 9-foot roomy body accommodation, special steel axle and springs, Timken roller bearings—and the wonderful Ford axle becomes the jack shaft without a single change—all for \$350.

THERE IS NOTHING COMPLICATED about the attachment—it comes complete—no other parts required—and the selling price is only \$350. It slips on to any Ford—new or old alike—without any bother or trouble. No skilled workmanship required—two men in a few hours can complete the job.

YOU MAKE BIG MONEY ON EACH attachment sold, more money on the sale of the wheels, tires and body equipment taken off the old car, an additional profit on the new truck body you sell and then you sell a new Ford—and you haven't any bothersome, money-losing trade-ins to contend with—can't beat that, can you?



(When Writing to Advertisers, Please Mention MOTOR TRUCK.)

# The MOTOR TRUCK

*Devoted to Motor Driven Business  
Vehicles of all Classes*

Pawtucket, R.I.

Vol. VII. No. 3.

MARCH, 1916.

## BOSTON TRUCK SHOW PROMOTES BIG BUYING.

**Lack of Space Limited Exhibits and Denies Many Prospective Exhibitors—No Innovations and Few New Machines—Manufacturers and Sales Agents Anticipate Extreme Demands, Especially for the Smaller Type Vehicles.**

JUDGED from any point of view the exhibition of motor trucks in connection with the 14th annual show of the Boston Automobile Dealers' Association, which, while a department of the exposition, was organized by the Boston Commercial Motor Vehicle Association, was decidedly a success. The show itself was, as a whole, the largest that the Mechanics' building has ever housed, and though blizzard weather prevailed practically all of the time, this seemingly did not influence the attendance. According to the statement made by Chester I. Campbell, the number of visitors was larger than ever before, and had the conditions been as they may be ordinarily expected for early March, the building would by no means have been adequate to accommodate the visitors.

New England people are always attracted by the Boston show in large numbers, and coming, as many thousands do, from considerable distances, there is no

doubt the weather was discouraging. Had the ground been bare, instead of covered with at least a foot of snow, and had the days been bright instead of stormy, without question there would have been buying in much larger volume, and yet, accepting the statements of the exhibitors as a whole, the sales greatly exceeded

those of previous years and the number of prospects are far more numerous than ever before.

What has been stated applies to the show generally, and while it was true with reference to pleasure cars, it should be greatly emphasized with regard to trucks, that the interest was never so great and a far larger number of machines were pur-

chased than during any previous exhibition. The Boston shows have always been noted for the buying. In fact, they have always been the most productive of the year so far as individual buyers are concerned, and because of the remarkable prosperity of all the industries and the unusual impetus of commerce the demand



An Aisle in Department C. Showing the Stands of the International Motor Company, Locomobile Company of America and Chase Motor Truck Company, and Their Displays of Mack, Saurer, Riker and Chase Trucks.



A Portion of the Display of the White Company, Which Was the Largest in the Truck Department, Consisting of 10 Machines.

for machines is far in excess of what it would normally be.

The census of the exposition showed that 429 chassis and completed vehicles were displayed, of which 120 were trucks, and of the 109 exhibitors, 38 were makers of freight carrying vehicles. One will perhaps accept the face value of the figures with the assumption that they are not especially significant, because they are not as large as those reflecting the exclusive truck shows of 1912 and 1913, but there are many conditions that must be considered before a determination is made.

This year the demand for space from pleasure car exhibitors was larger than ever, and for the first time in the history of Boston shows were pleasure vehicles displayed in stands in the balcony of Grand hall, and in addition Paul Revere hall, usually given over to accessory exhibits, was devoted to cars. Besides this, a number of cars were crowded into the basement, in departments C and D, in which the trucks were exhibited, and this further limited the exhibitors. If exhibition area had been available there is no doubt that fully 50 different makes of trucks would have been shown, and every exhibitor would have taken more space.

The limitations of the departments necessitated congestion of all the exhibits, and concerns that build several sizes of vehicles were compelled to show but a single type, while as a rule the stands were so filled that the machines could not be seen to good advantage, and there was very generally lack of space in which to receive interested visitors. These conditions were extremely adverse, and one must assume that the salesmen

were handicapped by them.

#### Buying Was in Large Volume.

But the sales were made because the trucks were wanted, and the lists of prospects accumulated because many who intend to purchase wanted to see the machines in the streets and did not care to expose themselves in the snow and slush and the bitter wind that prevailed practically every day. Because they were unable to obtain space a number of truck dealers showed their vehicles outside of the building, and while their opportunities were limited as compared with the show exhibitors, all of them believed that they had been sufficiently compensated by the interest that was manifested.

Not as many machines were used for demonstrating purposes as in past years, probably because of the weather and the fact that there is no need of convincing buyers of the practicality of power vehicles. With rare exceptions the prospective buyers understand fully the utility of trucks and the majority desire to learn how machines can be economically used by them in the particular conditions in which they must be operated.

#### The 10th Show of Motor Trucks.

The first display of power trucks was made in connection with the automobile show of 1907, so that the exhibition was the 10th in Boston at which machines were exploited. Those of 1912 and 1913 were exclusively devoted to motor trucks and wagons. In this period of 10 years remarkable progress has been made by the manufacturers—progression even more marked than with pleasure vehicles, and the development has been with the purpose of obtaining practicality and haulage economy rather than the qualities that



The Stand of the General Vehicle Company, at Which Was Shown General Vehicle Electric Machines and a G-V-Mercedes Six-Ton Chassis.



The Exhibit of the H. Ross Maddocks Company, with the Latest Stewart Machine, a 1000-Pound Delivery Wagon, in the Foreground.

are demanded by purchasers of pleasure cars.

The first exclusive truck show was held in 1912, and during the four years intervening since that exhibition the public has been educated by the economic value of machines to a degree that is surprising, even to those who have been close observers of the industry. There is no doubt existing with business men of the economy that can be obtained with power trucks, and there is today very general recognition of the quality of units that are used in their construction.

#### The Use of Standard Proven Units.

If there is any one factor that has contributed toward establishing confidence in truck service, it is the very general inclination of manufacturers to use parts that are regarded as proven. By this is meant that innovations are not favored unless they are thoroughly established for practicality and utility, and yet when a construction has been thoroughly tested and its value known there is no hesitancy in adopting it. This statement may be emphasized by brief consideration of the different types of power transmission now the vogue with truck builders.

The shaft and bevel gear drive to some form of live rear axle is practically universal construction with pleasure car builders. The practicality, utility and economy of this method of transmitting power has never been questioned by buyers so far as its application to cars is concerned, but there is common acceptance by those who own and constantly use such cars that this transmission is not always practical for truck construction. This does not mean condemnation of what is generally known as shaft drive, but approval of other methods when the load capacity is

in excess of 3000 pounds, and speed is not so much required as is fullest dependability.

#### Makers Turning from Chain Drive.

Chains were almost universally used by builders of the first types of pleasure cars to transmit the power to the back axles, but eventually the shaft was adopted as being the more satisfactory construction, this being determined by experience and knowledge obtaining with continued service. Chains were used for trucks, however, because they afforded the simplest and most practical method of obtaining the large degree of reduction necessary for low speed and greater power application. But just as the shaft drive was adopted

for pleasure cars almost to the exclusion of chain transmission, the builders of trucks have turned to other systems, the worm and the internal gear drive, for machines of even small capacity.

This is borne out by an analysis of the different machines exhibited at the show which may be regarded as representative of the industry. For example, out of 120 vehicles, chassis and equipped with bodies, 51 were worm driven, 41 were shaft driven, 12 were driven by side chains, 10 by internal gears, three were driven by a single chain and three were electric, driven by combination of housed silent chain and double side chain.

#### Analysis of the Drives by Makes.

Taking the machines by makes, 17 were driven by worm and worm gear, 11 by shaft and bevel gears, seven by internal gears, nine (including two electric) by double side chains, and one by single chain. There were in all 38 different makes of vehicles shown, but



The Stands at Which Were Seen the Jeffery "Quad," the Jeffery "All-Purpose" Wagon and Three Sizes of Federal Worm Driven Trucks.





Where the Diamond T Truck Chassis,  $\frac{3}{4}$ -Ton, Two-Ton and  $3\frac{1}{2}$ -ton Load Capacities, Were Shown for the First Time at a Boston Exhibition.

the additional seven represented by the above statement is accounted for by some of the manufacturers having two power transmission systems, shaft and double side chain, to illustrate, or both worm and internal gear. But viewed from any angle there appears to be a very general leaning toward the worm and internal gear drives as being demanded by the purchasing public, and every manufacturer is justified in producing what experience has proven will meet popular approval.

The change of design from chain or shaft to worm or internal gear has been decidedly marked in the past year, and considering the exhibits at the show, 24 makes were driven by these two against 21 using shaft or chain, or a ratio of 53.4 per cent. against 46.6 per cent. This is remarkable when one considers the comparatively short period that the worm and internal gear have been regarded as being dependable and reliable. While the increase in the number of builders using the worm drive has been noticeable because of its rapidity, the progress made similarly with internal gear transmission has been even more marked, and the exhibition did not as completely represent this as it did the utilization of the worm and gear wheel system.

#### Machines That Were Exhibited.

The makes that were exhibited at the show, within the building, were the following: Autocar, Buick, Chase, Commerce, Cunningham, Denby, Diamond T, Ford, Federal, Garford, G-V-Mercedes, General Vehicle, Indiana, International, Jeffery, Kelly-Springfield, Knox tractor, Lippard-Stewart, Mack, Maxwell, Menominee, Metz, Netco, Packard, Pierce-Arrow, Republic, Reo, Rik-

er (Locomobile), Saurer, Selden, Signal, Stewart, Studebaker, Transport tractor, United, Vim, Ward, White, and in addition to these Acme and Kissel trucks were exhibited in the street, as were several other makes, because of inability of the representatives to obtain display space. The Ford machines were not exhibited by the maker, but by owners, one a body manufacturer, another a specialist in converting Ford chassis to greater haulage capacity, and a third was used by C. H. Martin to demonstrate the Martin Rocking Fifth Wheel, by which machines of any type can be converted to haul semi-trailers. There was also an exhibition of three fire apparatuses

and a passenger body built by G. F. Kress & Son of Lawrence, Mass., on White chassis.

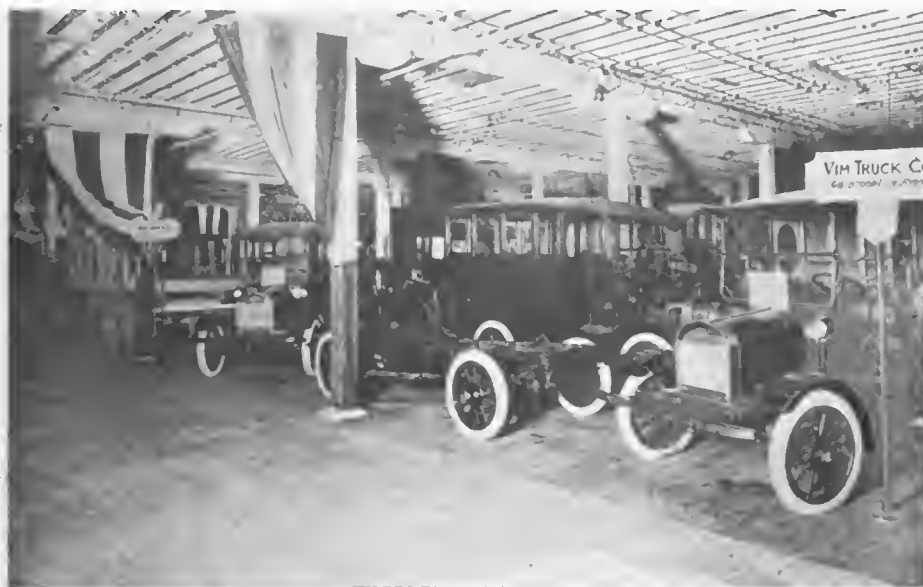
The exhibitors of shaft driven machines were, by makes: Autocar, Buick, Commerce, Cunningham, Ford, Maxwell, Reo, Studebaker, Vim and White. The displays of internal gear driven vehicles were, by makes: Denby, G-V-Mercedes, International, Jeffery, Republic, Selden and Stewart. The worm driven machines by makes were: Chase, Diamond T, Federal, Garford, Indiana, Kelly-Springfield, Lippard-Stewart, Mack, Menominee, Netco, Packard, Pierce-Arrow, Riker, Selden, Signal, Transport tractor and United. The trucks driven by double side chains were Garford, International, Kelly-Springfield, Knox tractor, Mack, Reo, Saurer and White, and the General Vehicle and Ward electric. The Metz wagons were driven by a single enclosed chain from the jackshaft to the rear axle.

Considered from any aspect the showing was



An Aisle Showing a Part of the Exhibit of the J. W. Maguire Company, Agent for Pierce-Arrow Worm Driven Trucks.





A View of the Exhibit of Vim Motor Trucks, Load Capacity 1000 Pounds, Which Were Displayed for the Benefit of New England Buyers.

especially interesting. It was not an exhibition of radical types. To the contrary, one may maintain that the general purpose of the manufacturers is to standardize so far as is possible and to perfect a single design with reference to every type produced, so far as this is possible. The condition of the industry differs decidedly from what it has been in former years.

When vehicle builders produced all the components in the machines there was the best of reason to construct a single type rather than a series of sizes, because of the obvious obstacles to successful or rather economical manufacturing. That is, each size required complete factory equipment, from patterns to machine tools, so that production was much more costly. Some concerns do make from raw material practically everything entering into the vehicles, but a very considerable number of them today purchase components from specialists in production, obtaining units that are standardized and the sizes that are required, either regular or special types.

This policy minimizes the factory equipment and lessens the overhead expense, so that machines with what are recognized as highly efficient and enduring units may be produced at costs that would not be possible in other conditions, and which also afford as great a range of sizes as the market may demand. The experience of a considerable number of concerns that begun production of but one size is that there is sufficient demand for other sizes to justify building these, and yet were costly investment in machinery and equipment necessary there is reason to believe this would have been a deterrent if not a prohibi-

tion, because of the large investment and the comparatively limited number that might be disposed of, for the buyers of small and light machines are decidedly the most numerous.

#### Exhibits Mainly Small Machines.

The demand for machines is perhaps indicated by the types that were exhibited, and a survey of these shows that one was 750 pounds capacity, 16 of 1000 pounds, one of 1200 pounds, 12 of 1500 pounds, 19 of 2000 pounds, 22 of 3000 pounds, 17 of 4000 pounds, one of 5000 pounds, four of 6000 pounds, seven of 7000 pounds, four of 8000 pounds, nine of 10,000 pounds, two of 12,000 pounds, one of 20,000 pounds and four pieces of

fire apparatus. Reviewing this summary, one will understand that of the 120 machines shown 88 were 4000 pounds load capacity or less, 16 were from 5000 to 8000 pounds, and 12 of 10,000 to 20,000 pounds, this not including the fire apparatus. One will also note that of the total 49 were of 2000 pounds or less capacity, and that 39 others were of either 3000 or 4000 pounds.

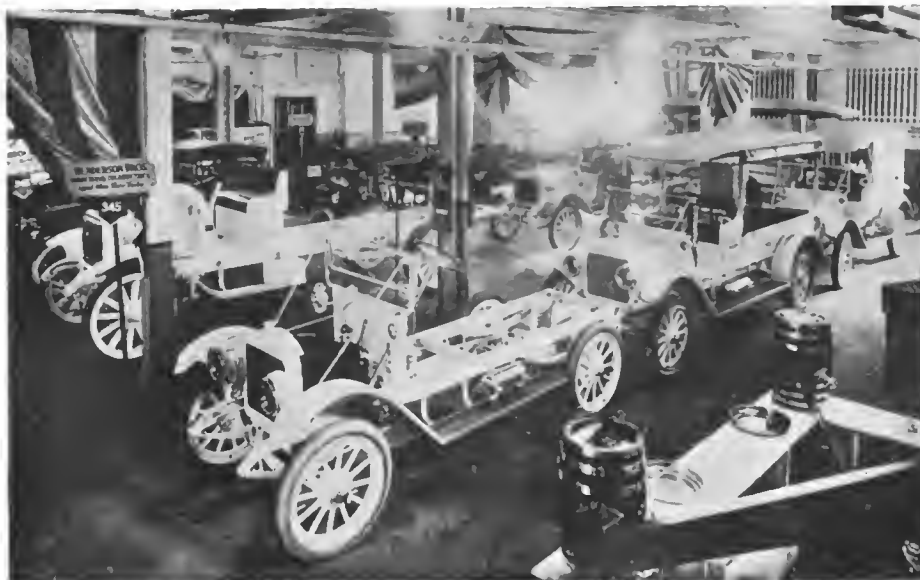
In considering these figures one will be impressed with the fact that more than two-thirds of the vehicles shown were what might be regarded as adapted for light haulage, although the impression may be that motor trucks are required because of their much greater load capacities. The machines were exhibited by men who have an intimate knowledge of the equipment that is most generally sought.

#### Largest Demand for 1000-Pound Trucks.

But even more impressive than these figures is the statement of a man of broad and successful experience in the eastern market, who maintains that fully 50 per



Part of the Display of Packard Chainless Trucks, Which Consisted of Eight Machines of Various Sizes and Body Equipment.



The Exhibit of Signal Trucks, Made by Henderson Bros., Included Six White Show Chassis Ranging in Capacity from 1200 Pounds to Five Tons.

cent. of the sales at the present time are machines that have load capacity of approximately 1000 pounds, and he states that fully 85 per cent. of the business in immediate prospect will be supplied by vehicles of 3000 pounds capacity or less. While this may not precisely represent the actual conditions obtaining elsewhere with reference to the sizes of machines that will most readily sell, it may be regarded as reflecting very accurately the demand upon the industry, for this is a statement of the New England market that is based upon extensive experience and with the sale of all sizes of vehicles.

The machines that were displayed were in every way conventional. There were no innovations in design. In fact, the constructions may be said to be approaching rather than diverging in general characteristics and principles, from the very obvious fact that no business man cares to engage in experimentation. He prefers to buy what has been proven and he can depend upon. This, without question, has been a very important factor in the successful manufacture of what are known as "assembled" trucks. As a rule they are built from units that are regarded as standards by the industry and which are probably better known to the motoring element of the country than any others.

This statement may be emphasized by the fact that engines, clutches, transmission gearsets, universal joints, rear and front axles, springs and frames are not usually built by the vehicle manufacturers. Frequently the engines, clutches, gearsets and rear axles are specially constructed, but the other components are obtained from specialists. Because of this fact individuality of design is in

assembling, as a rule, rather than in the components.

#### One New Tractor Type.

There was but one literally new machine displayed, this being the Transport tractor, which is built by the Transport Tractor Company at Brooklyn, N. Y., and which was seen for the first time. One vehicle was displayed in the building and another on the streets. This is an 80-inch wheel-base worm driven tractor for use with a semi-trailer and has a load hauling capacity of five tons. It is not a truck in any sense and has been carefully thought out to obtain efficiency, simplicity and accessibility. One of the features of the machine is the patented coup-

ling, a hemispherical construction that is self-centering and aligning, and which insures attaching the trailer body in very short time because accuracy of placing the tractor under the body is obviated. The chassis is extremely well built and because of its comparatively small operating cost and its large haulage capacity, the manufacturer expects it to be in considerable demand.

#### New Types of Older Makes.

A number of makes of machines that had not been previously exhibited were shown, among them being the Diamond T, of which three of the five sizes were displayed; the Maxwell, Metz, United, Vim and Cunningham being included in this classification. But a considerable part of the displays were new types, including the 2000-pound Buicks, which are shaft driven; the model B Chase, a worm driven machine; the 1500-pound internal gear driven Denby; the 3½-ton Federal truck, the worm driven one and two-ton Garfords, the 2000-pound internal gear driven Interna-



The Booth of the International Harvester Company with Its Display of Four Machines, Ranging from 1000 to 2000 Pounds Load Capacities.

tional, the Jeffery "rapid service" 1500-pound chassis, a worm driven Kelly-Springfield chassis, the 1500-pound and the 4000-pound Lippard-Stewart machines, a five-ton Mack truck with the radiator combined with the dash, the worm driven Menominee trucks, the chainless Packard trucks, including one, 1½, two, three and four-ton sizes; the Reo 1500-pound wagon, the two-ton internal gear driven and the 3½-ton worm driven Selden trucks, the full line of worm driven Signal trucks, from 1200 pounds to five tons capacity; the 1000-pound internal gear driven Stewart wagon, the Studebaker 1000 and 2000-pound machines, the Metz 1000-pound wagons, the Maxwell 1000-1200-pound machines, and the Cunningham, the latter being a special adaptation of a pleasure car chassis with a body that is a combination casket wagon and hearse. This was a very fine example of coach work.

#### **Many Interesting Bodies Shown.**

To enumerate the different types of machines and the varying body equipment is impracticable, but there were a number of constructions that were specially interesting. Among these was the special horse ambulance constructed by the Monahan Vehicle Company, Providence, R. I., which is drawn by a one-ton Garford chassis as a tractor. This was described in the February issue of Motor Truck. The White exhibit included an ambulance and a patrol wagon, a passenger 'bus, a tower wagon for street railroad construction, a power dump body on a five-ton chassis, a tank wagon for lubricants and gasoline, and several other vehicles, and there was also a display of a fire pump, a combination hose and chemical wagon and a chemical wagon on White chassis, and a large open party wagon, this equipment being produced by G. F. Kress & Son of Lawrence, Mass.

One of the interesting adaptations was of an open express or furniture body on a Pierce-Arrow chassis by which the sides and the seats could be extended and the tail gate made a part of the flooring by braces carrying steps that support the tail gate. A pay-as-you-enter omnibus body, having capacity for nine passengers, that was exhibited at the Vim display, was extremely well designed, substantially constructed and excellently finished.

#### **Few Quick Discharging Bodies.**

Comparatively few quick discharging or dumping bodies were shown, probably from the reason that this equipment is usually installed on chassis of large capacity, less than a half dozen being exhibited. There were several types of body hoists, chief among these being those installed by the Monahan Vehicle Company, Providence, R. I., eastern representative for the Wood Hydraulic Hoist and Body Company. Several interesting displays were made by builders of light vehicle bodies, especially the types that are used for store delivery and in which protection of the loads is essential.

The majority of the bodies displayed were special equipment that had been designed to meet the requirements of purchasers, and much ingenuity and clever

adaptations were demonstrated in these constructions. But while endeavor had been made to obtain simplicity and accessibility, appearance and finish were qualities sought. For this reason the bodies as a whole were especially noteworthy.

The displays of specialties designed for truck construction or equipment were not numerous, for there was not available space for them. The West Steel Casting Company, Cleveland, O., showed a series of steel wheels for heavy vehicles, but other than this no exhibits of construction components were made.

Because of the proportions of the truck department there was a very strong sentiment manifested for an exhibition of these machines separate from the passenger cars for 1917, but no determination of this proposition has as yet been made, although the question of an exclusive truck show will be passed upon by the associations at meetings to be held within a comparatively short time.

#### **MANY MARCH ORDERS FOR PACKARDS.**

A rush of truck orders for immediate delivery was received by the Packard Motor Car Company during the early days of March. One of the most conspicuous of these was a repeat order for 11 heavy duty Packards received from the United Fuel and Supply Company of Detroit. The order called for more than \$50,000 worth of trucks. The earliest possible delivery of the trucks was asked, as there is an unprecedented rush of building activity in Detroit. The company regards it as sure that 1916 is to be a record breaking year in the truck industry. The truck plant is working night and day shifts and from present indications these are likely to be kept going throughout the year.

#### **RECORD SHIPMENTS IN FEBRUARY.**

The shipments of cars and motor trucks during February totalled 21,502 carloads, which is the biggest month in the history of the industry. It is an increase of substantially 100 per cent. over February of 1915, when 11,973 carloads were shipped. It would have been larger had the freight cars been available. It was necessary to ship 1500 carloads on ordinary flat cars or in box cars. Of 10,000 new automobile railroad cars ordered last year, 1200 are now in use, making the total number in service about 60,000.

#### **WILL BUILD ONE-WHEEL TRACTOR.**

A tractor to be produced by the Parrott Tractor Company, Jackson, Mich., is to be mounted on a single main drive wheel. The company has started operations in a plant formerly occupied by the Fuller Buggy Company on East Main street. By April 1, 75 men will be employed. The officers are: B. R. Parrott, president; Louis Goodhart, vice president and sales manager, and M. M. Stewart, secretary and treasurer.

## FIGHTING FREIGHT EMBARGO.

### Connecticut Manufacturers, Denied by Railroad, Do Haulage with Trucks.

Radical and what appears to be almost revolutionary transportation methods have been resorted to by Connecticut manufacturers who need raw material and who cannot get it into their factories because of the embargo established by the New Haven railroad against freight from the West that it may clear its tracks of the great number of cars that congest them.

Trucks have been used for long distance haulage in large numbers. One manufacturer has been operating trucks between Bethlehem, Penn., and his factory in Waterbury. There has been a vast amount of truck shipments to and from New York. If the present congestion continues until summer, when the roads are dry and good, this long distance trucking will be developed on an enormous scale and the results of the practical trial of motor trucks in actual competition with railroads may have a large influence on the future movement of freight.

In addition to the companies that are relying on the truck exclusively for the movement of their material there are many who have used it as one link in a chain of special arrangements by which they have secured stock with which to keep their factories operating.

The American Brass Company, which has plants at Waterbury and Ansonia, gets much of its material from Perth Amboy, N. J. Since the traffic situation has become acute it has had the material loaded on lighters at Perth Amboy and towed to New Haven through the Long Island sound. There it is transferred either to motor trucks or trolley express cars and carried to the factories.

Many of the big plants in the Naugatuck valley are securing their goods by shipments to Bridgeport by boat and from there they are hauled to the factory by truck.

One New Haven manufacturer badly needed some time ago a material that is made in Detroit. It was impossible to get it through as freight, so the company rented a Pullman car, loaded it with the cases, which were light, and brought it through attached to a fast passenger train. To get this material cost \$700.

One manufacturer who gets material from a point on the Pennsylvania lines has it shipped to Port Jefferson, on the north shore of Long Island, and there loads it on a boat, which brings it across the sound to New Haven, whence it is hauled to the factory by motor truck.

Another illustration of present conditions is found in the case of a manufacturer who had a car load of vitally necessary material on the New Haven road in New England. He tried every means of having the delivery of the car hastened. Finally he offered to

pay for hauling it to his factory the rate required for a private passenger coach, and with this inducement his freight car was made up with a passenger train and delivered without delay. But this was costly when the price is contrasted with freight rates.

### SULLIVAN COMPANY REORGANIZED.

The Sullivan Motor Truck Corporation has been organized at Rochester, N. Y., to take over the plant and succeed to the business of the Sullivan Motor Car Company, a concern that has been engaged in producing trucks at 1703 East avenue, in that city, for a considerable period. The company is capitalized for \$40,000 and it has 1350 shares of stock, 350 of which are preferred and valued at \$100 each, and 1000 shares of common stock valued at \$5 each.

The purpose of the company is to build motor trucks of 1½ and two tons capacity and, according to the articles of incorporation, it will build aeroplane motors. The directors of the concern are Dennis E. Sullivan, George T. Sullivan, Don E. Gorsline, James W. Comerford and Anna M. Sullivan, all of Rochester.

The Sullivan Motor Car Company has been established for a number of years and is well and favorably known. Agencies have been established in many of the commercial centres of the country and an aggressive selling campaign will be inaugurated. The intention is to produce machines of high grade.

### TRUCK SHOW AT SOUTH BETHLEHEM.

A truck show was held March 1 in the Coliseum at South Bethlehem, Penn., which attracted a great deal of attention and was regarded by the truck dealers of the locality as a success. It is the first time that a truck show, in addition to the passenger car display, was attempted. One day was set aside as fireman's day and fire apparatus was shown, much of it for only one day. Many firemen from surrounding towns visited the display.

The trucks on display included the Packard, International Harvester, Rush, Autocar, Reo, Bell, Vim, Republic, Maccar, Detroit Commercial, Stewart, Garford, Little Giant, Metz, Koehler, La France, McFarland, Empire and Ford Chemical.

### PACKARD WAR TRUCK CHANGES.

Packard trucks used by the French army are now being fitted, at the suggestion of the French army engineers, with an angle iron radiator guard, to make less disastrous the effects of slight collisions, and the rear of the truck frame is equipped with an angle iron guard which is attached to heavy springs. A box body designed by army engineers has a top with heavy bows over which a tarpaulin is spread. The truck is a three-ton unit with an especially long wheelbase.

## THREE TYPES GLOBE SIX-CYLINDER TRUCKS.

**I**N OFFERING the public three models of six-cylinder trucks the Globe Motor Truck Company of Northville, Mich., has made available to truck buyers a principle that has been very highly regarded by passenger car users for years.

The passenger car six-cylinder enthusiast prefers this type of engine chiefly because it operates smoothly and without the vibration which is often characteristic of the four-cylinder. This quality is of consequence in truck manufacture, but the advantages claimed for the six-cylinder power plant in trucks are based chiefly upon the value on hills or in rough going of the more nearly continuous power impulses of the six-cylinder motor.

The makers take the position that to obtain a four-cylinder truck that can be successfully used in very difficult operating conditions, it is necessary to buy an overpowered and over capacity vehicle.

### Has More Power Impulses.

The technical argument is that in the four-cylinder there are only two power impulses to a crankshaft revolution and between these the flywheel and crankshaft must be depended upon to keep the machine going by momentum. But in very hard work this force is insufficient and the motor is likely to be stalled, even though the power of the motor is sufficient for the work.

The six-cylinder motor of the same power, by applying the power more continuously, keeps the truck under way and makes it, therefore, more efficient in severe working conditions, with the result that a smaller, more economical truck can do the work all the year around.

The elimination of vibration, which is characteristic of the four-cylinder engine, is considered important because vibration is claimed to be one of the most prolific sources of truck depreciation. The fact that most hills can be taken on high speed gears is held to be an important influence for economy in gasoline.

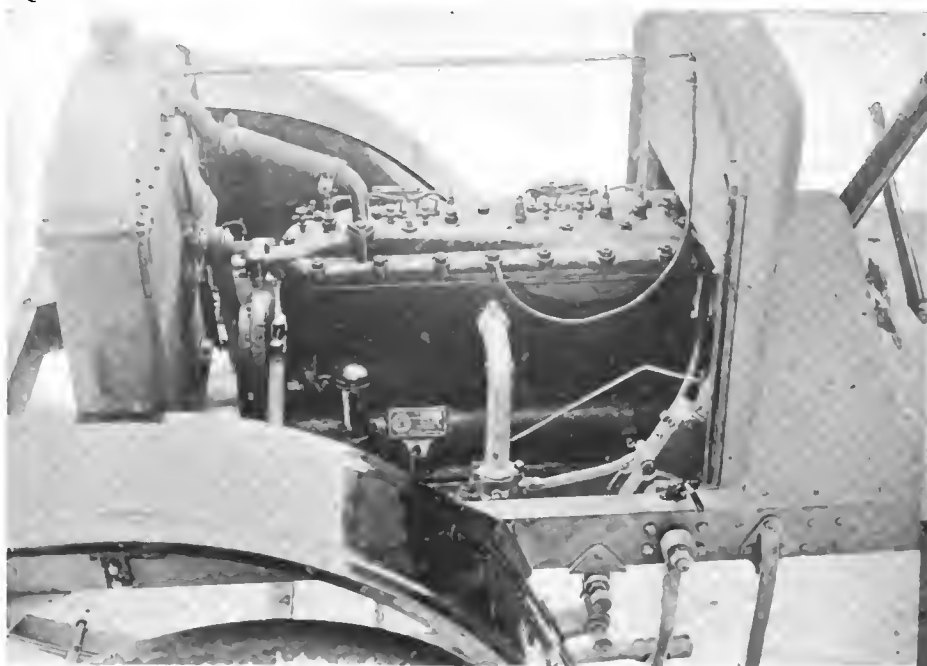
### Built by an Old Established Firm.

The truck is the product of the Globe Furniture Company, Ltd., of Northville, Mich. For 40 years this firm has been engaged in the manufacture of church and lodge furniture. The furniture factory in the future is to be devoted to the production of stock and special truck bodies. For some time the company has been producing also the Globe truck.

Globe trucks have been approved wherever dealers

have been secured and increases in production plans have been frequent during the past few months. It is the present policy of the company to make agency contracts with only a limited number of dealers who can handle the output which the supply of parts and materials under contract assures the building of. This will make deliveries certain to each dealer and enable him to develop fully the territory which he receives.

A campaign of dealer help has been devised which places in the hands of the dealer every week material for circularizing some one line of business in his territory. The material is illustrated and treats of costs of operation, and summarizes experience in all parts of the country with regard to the line of business under consideration.



The Six-Cylinder Continental Engine Included in the Power Plants of All Three Types of Globe Light Trucks.

The three models consist of a  $\frac{3}{4}$ -ton and one-ton internal gear drive trucks with six-cylinder motors and a one-ton worm drive truck for those who prefer that type of power transmission.

The motors are a Continental L head type, with bore of  $3\frac{1}{2}$  inches and stroke of  $4\frac{1}{2}$  inches, the cylinders being cast en bloc, with a three-bearing crankshaft and a constant pressure oiling system. The carburetor is a Master, and ignition is supplied by a Splitdorf high-tension magneto. A Long radiator of the built up type with centrifugal pump is included in the cooling system.

A multiple disc dry plate clutch and a transmission gearset with three speeds forward and reverse, of the sliding gear type, are parts of the unit power plant. There are two universal joints in the  $1\frac{3}{4}$ -inch tubular shaft and the rear axle is a Celfor internal gear drive unit with Bower roller bearings on the outer hub and



Hyatt high duty bearings at the other points. The front axle is a Sheldon drop forged I beam. Service brakes are provided with equalizers and are of sufficient power to lock the wheels even on steep hills. The emergency brakes are double-acting, internal expanding. Both front and rear springs are semi-elliptic.

The artillery type wheels have 14  $1\frac{3}{4}$ -inch spokes, with 34 by three-inch front tires and 34 by  $3\frac{1}{2}$ -inch rear tires. The wheelbase is 126 inches, with 98 inches of frame behind the driver's seat. The weight of the  $\frac{3}{4}$ -ton car is 2850 pounds and of the internal gear one-ton truck 3000 pounds, while the one-ton worm drive truck weighs 3150 pounds. The ignition and electric starting and lighting system is furnished at an extra charge. The price of  $\frac{3}{4}$ -ton truck is \$1085, of the one-ton internal gear drive \$1275 and of the one-ton worm drive \$1375.

The worm drive truck is similar in general design, with the exception of the axle, which is a Timken-David Brown, to the internal gear drive trucks.

#### GREAT ADDITIONS TO STEEL CAPACITY.

Tremendous expansion is under way in the steel industry which will increase the capacity of the country to produce steel by millions of tons by the end of another year. Open hearth steel mills with a rated capacity of 4,300,000 tons are under way and construction is being rushed day and night upon them. The United States Steel Corporation has 18 open hearth plants with a rated capacity of 1,500,000 tons already under construction. The independent steel companies have 73 open hearth plants planned or under construction, which will produce 2,700,000 tons of steel annually when completed. These plants will enable the independents to produce fully as much steel as the United States Steel Corporation.

It is probable that the first of these plants to be put in operation will be completed late in the summer or early in the fall, and it will be 1917 before the country can get the benefit of all of them. As it is now delivery cannot be guaranteed by any of the mills inside of from six to nine months. From inquiries that are made, some of which are not followed by orders because of the conditions in the trade, it is evident that vast quantities of additional steel could be sold for both home and export consumption if it could be made. At present, for the first time in its history, the United States is producing more steel than all the rest of the world put together.

#### MOTOR HIGHWAYS IN MEXICO.

Between Tampico and Panuco, Mex., a distance of 35 miles, the first highway ever built in that country exclusively for the use of motor cars, has just been completed. The road is to be used for cars and trucks used in the oil business, which is booming in both cities. Heretofore all transportation between the two

towns has been by boat upon the Panuco river. The oil companies maintained expensive launches for the accommodation of their officials and men. A regular motor car service is now to be established between the two terminals.

Many of the companies are building roads for their private use and these are expected later to be connected with longer roads and thrown open to the public. The state and federal governments of Mexico are favorable to road development. Plans are now being discussed for a road from Tampico to Monterey, more than 325 miles, and another between Tampico and Matamoros on the American border at the Rio Grande, a distance of 315 miles. The states of Tamaulipas and Nuevo Leon will lend financial aid to these projects and the federal Mexican government is expected to give similar assistance.

#### TO MAKE OVERSIZE PISTON RINGS.

Following the adoption of a standard of .020 oversize for the first regrinding of cylinders by the Society of Automobile Engineers, the Burd High Compression Ring Company has decided to turn out all its standard rings in oversizes that much larger than the standard. This will add 155 sizes of rings to those it is now manufacturing.

Previously, when there has been no standard for regrinding, each mechanic took off enough of the cylinder wall to make the bore again round, whatever in his judgment that might be. It has been easy to secure oversize pistons, which with some grinding down could be made to fit the cylinders, but it has often been necessary to use standard piston rings on the larger pistons.

These rings were not adapted to the use made of them and they frequently impaired the efficiency of the engines. The new standards with the rings ground to fit will greatly simplify and should improve the work of regrinding cylinders.

#### SMITH JOINS EDISON COMPANY.

George Drake Smith, for the past two years supervisor of agencies for the General Vehicle Company, Inc., has been appointed special assistant to Harrison G. Thompson, vice president and general sales manager of the Edison Storage Battery Company. Mr. Smith will make his headquarters at the factory and main office at Orange, N. J. Mr. Smith is widely known in the electrical industry, especially to central station officials and operators, through his efforts to promote the sale of electric freight vehicles.

The United States Rubber Company of New York City has taken over the Iroquois Rubber Company of Buffalo and combined it with its own branch. It will be operated by J. B. Waterson, formerly manager of the Iroquois company.



## RIKER'S NAME GIVEN TO LOCOMOBILE TRUCKS.

**T**HE Riker Truck is to be the name of the refined and improved worm driven trucks with which the Locomobile Company of America is to make its big drive at the American market. These are substantially the same trucks, except for refinements, that the



Andrew L. Riker, Chief Engineer of Locomobile Company of America.

company has been producing for the past two years. In the opinion of the company and of A. L. Riker, vice president and chief engineer, it has been standardized in its present form and will not be radically changed for a long time.

The change of name was announced by J. T. Roche, Jr., secretary of the Locomobile Company. For four years the

company has been building trucks in moderate numbers. It has studied truck design and the truck business very carefully, both in America and abroad.

Its truck had been developed to a point of high excellence when the war in Europe broke out. It was built strongly and for long wear and was sold in the belief that with reasonable care it would be able to give reliable service for 10 years.

### Many Riker Trucks Sent Abroad.

This truck has been bought and used with satisfaction by the governments of Great Britain, Russia and France, while four of the trucks have been thoroughly tried out by the United States government.

At the beginning of the war, when the preliminary tests were made, a five-ton truck was taken to England and tried on a hill where trucks of many makes were tested and some were found wanting, even when carrying only normal loads. On this hill was an old Roman road laid out straight up the grade, a construction that would not be approved by modern engineers, who have learned to avoid steep gradients.

The American five-ton truck was conservatively rated by the English buyers as a four-ton truck, but six tons were loaded upon it and it ascended the grade without being overworked. As a result of

this test a large number of the trucks were ordered and these have been constantly shipped to Europe, being driven from Bridgeport to New York to be loaded on the steamers. Contrary to general belief that the life of trucks in war service is very short, statement is made that practically all of these trucks are in use. They have escaped the destruction of the enemy's artillery and endured the very rough roads over which they have carried heavy loads at high speed.

### Few Changes in Riker Trucks.

The Riker truck is substantially the same product that was turned out by the Locomobile Company before the war. Some slight changes have been made, however, as a result of the experience in military service. These were recommended, either by the European army engineers who watched the trucks or by the Locomobile company's own men who observed them in the field.

The reason for the change of name is the fact that Locomobile has come to suggest a very luxurious and expensive passenger motor car which is turned out in very small numbers for the limited number of people who can afford to buy them. It implies luxury and high cost.

The truck, on the other hand, is a thoroughly finished piece of commercial mechanism, which sells as low as or lower than the average truck of the same kind. It is built for economy and efficiency, and luxury and expensive fittings have nothing to do with it. The whole problem of building a good truck is different from that of building a smart car and the ideals which are connected by the word Locomobile have no connection with the truck.

Furthermore, to those who know the history of motor vehicle design and construction, there is much force in calling it the "Riker."

### The Work of a Noted Designer.

Andrew Lawrence Riker, the chief engineer and vice president of the company, is one of the best known and most prominent automobile engineers in the United States. He built commercial vehicles 18



Four-Ton Riker Truck, with Trailer, Owned and Operated by the Lake Torpedo Boat Company, Bridgeport, Conn.

years ago that were purchased by such firms as B. Altman and the Gorham Manufacturing Company in New York and are still used by them.

He also built one of the first racing cars ever produced in this country. As early as 1901 he had running a four-cylinder car with a sliding gear transmission, steel frame, gear drive, electric generator and other features in which he pointed the way that has led to the development of the modern passenger car.

One of his racing cars was the first to compete successfully with European products. In the Vanderbilt Cup race of 1905 a Locomobile driven by Joe Tracy defeated the German and Italian teams and three of the five French drivers, finishing third. Later one of these cars won the Vanderbilt Cup.

When the Society of Automobile Engineers was first formed Mr. Riker was its first president, starting it on a career of usefulness and importance to the American industry which is every year intensified. He was recently chosen by the society as one of its representatives on the United States Naval Advisory Board.

The company feels that it is important to separate the two branches of its business sharply and that the change in the truck name will accomplish that end. Both types of vehicles will be backed by the guarantee of the Locomobile Company of America with its well known policy of thorough, accurate workmanship and fair treatment of the purchaser.

#### WANTS TRUCK TIRE SIZES REGULATED.

Edwin Duffy, highway commissioner of New York state, addressing the students in the Columbia university highway engineering course, said that regulations must be passed limiting the weight of trucks with relation to the number of square inches of tire surface in contact with the ground and with relation to the speed at which they travel. If this were not done, he said, it would be impossible to bear the expense of maintaining the roads that have already been built. The truck, he said, was here to stay and provision must be made to use it in the most economical way. All users of the highway, including horse drawn vehicles, should be regulated, he maintained.

#### OUTPUT OF 75,000 TRUCKS THIS YEAR.

An output of 75,000 trucks for the coming year is predicted by authorities who are capable of judging accurately the probable production of the truck factories. There are now more than 100,000 trucks in use in the country. At the beginning of 1912 there were about 20,000 trucks in service. American makers are all working overtime—some of them night and day—and are entirely unable to fill their orders. It is probable that if all war orders were withdrawn at once they would be able to work at full capacity on domestic business.

#### S. A. E. MID-SUMMER CRUISE.

According to the announcement of the complete programme of the mid-summer cruise of the Society of Automobile Engineers, this year's trip, which will start June 12 and continue for four days, will be the most extensive and important yet held by the society. The start will be from Detroit aboard the steamer Noronic, the same vessel used last year, on Monday, June 12, at 2 p. m.

The complete itinerary is: Monday, leave Detroit at 2 p. m.; Tuesday, arrive at Mackinac island, 11 p. m.; leave the island at 6 p. m.; Wednesday, arrive at Killarney, Ont., 7 a. m., where the day will be given over to picnics, etc.; Thursday, leave Killarney at 5 a. m., arrive at Owen sound 3 p. m.; leave Owen sound at 7 p. m.; Friday, arrive at Detroit, 6 p. m.

The tentative programme for the four-day session as drafted by George W. Dunham, chairman, provides for about the same amount of professional discussions as last year, but allows more time for recreation. Only one of the evenings will be devoted to business, the other three being given over to entertainment, including dancing.

There are accommodations for about 550 persons on the steamer, and inasmuch as the experience last year was that the reservations were taken long before the start and that there is evidence that this year's cruise is to be even more largely attended, it is urged that those intending to go should make their reservations as soon as possible. Applications should be sent to the 1916 Meetings Committee, at 601 Kerr building, Detroit, Mich., and checks must accompany all orders for tickets and reservations.

#### INTERESTING ASPHALT PRIMER.

A very interesting booklet, entitled the "Asphalt Primer and Collodial Catechism," has been issued by the Barber Asphalt Paving Company, Philadelphia, Penn. The text and illustrations take the reader through the history of road development, starting with the Egyptian highway constructors, through the Roman and middle age periods and up to the modern era.

It is intended for persons interested in roads and road building, as every motorist is or should be, and it contains some very startling facts and figures as well as educational illustrations.

#### WILL BUILD FACTORY IN ST. PAUL.

The Packet Motor Car Manufacturing Company of Minneapolis has chosen W. F. Tobin of St. Paul president. The firm is at present making a light delivery truck. A new factory of larger capacity is to be built shortly in St. Paul. Other officers of the company are G. M. Davis, St. Paul, vice president and general sales manager; R. Brasie, Minneapolis, secretary-treasurer and general manager; E. F. Hopkins, Minneapolis, and J. A. Brasie, Monticello, Minn., directors.

## GOOD ROAD DIVIDENDS.

### Large Increase in Property Value Through the Betterment of Highways.

Money spent in building concrete roads in Wayne county, Mich., which contains the city of Detroit, is earning dividends at the rate of 125 per cent., according to figures that have just been issued by the county road commissioners. The commission has spent \$2,000,000 raised by bond issue in the eight years from 1906 to 1914. During this same period the assessed valuation of the property in the county outside of Detroit has increased from \$62,707,000 to \$114,548,120, or 82.6 per cent. Of this increase 35 per cent., or \$22,000,000, is credited to the results of road improvement, as the assessed valuation of the city of Detroit has increased 47.7 per cent. during the same period. On that basis the increase in the value of the property is 11 times the amount spent on roads.

More than 125 miles of concrete road has been put down with entire success. It has never been necessary to tear up a single section of road after it has been laid. The pavement promises to outlive by a long time the bonds that were issued. Every mile of road that is laid cuts down the upkeep cost per mile. Last year, although 45 miles additional had to be maintained, the cost of the work was \$5178 less than the year before, despite the fact that there are 1245 miles of macadam, gravel and other roads to look after. In this county, as elsewhere, 90 per cent. of the traffic is carried on 20 per cent. of the roads. The commissioners believe that 350 miles of concrete road should be constructed and then there would not be an inhabitant of the county who would be more than three miles from a good concrete surfaced highway.

## FITTED FOR ROAD OR TRACK.

To provide a ready means of escape from Mexican bandits should they become threatening, R. L. Budrow, general manager of the El Tigro Mining Company of Sonora, has secured railroad wheels, which are quickly interchangeable for the regular wheels on his 45-horsepower White touring car. In this he would make his getaway over the railroad tracks toward the American border in the event of danger.

## BUYS 17 LIGHT PACKARD TRUCKS.

The Loose-Wiles Biscuit Company has increased its fleet of Packards to 50 trucks by the addition of 17 light service Packards. During the first 45 days that these trucks were finished and shipped at the factory, the shipments amounted in value to \$417,900. Additional shipments to the extent of \$75,000 were held up because body builders had not completed the bodies.

## TRUCK INDUSTRY PROSPECTS.

### Probability That It Will Increase to Level of Present Car Production.

Announcement that the 1915 production of the Federal Motor Truck Company, one of the most successful and prolific producers in the power vehicle industry, reached a total of 1588 trucks, indicates the great development that is still possible for the builders of freight carrying machines.

It is now about the proportions of the passenger car industry 10 or a dozen years ago. At that time the pessimist was proclaiming that the motor car was a fad and would soon pass its zenith in popularity.

Factories which in those days were producing less than 1500 cars are now producing three times as many thousand cars. It does not follow, of course, that eventually the truck industry must be as large in the number of units built as the passenger car, but it is not unreasonable to suppose that it will be as large.

There are still 21,000,000 horses in use in the United States and the overwhelming majority of them are used in commercial pursuits of one kind or another. The history of the passenger car shows that as the number of trucks made and sold goes up the price will come down, so that trucking in the future will be much more economical than it is now.

With each step in the reduction of the truck price it will find a larger market and will be able to compete on more favorable terms with horse equipment. Conditions indicate that horse costs are bound steadily to rise indefinitely.

Furthermore, the development of special loading devices, removable bodies, warehouses and freight stations especially designed to permit rapid loading of trucks and their economical operation has as yet scarcely begun. Then there is the 'bus business with its enormous possibilities and interurban freighting.

Countless uses for the truck that are now barely practical on the score of cost will become more and more practical. Unless some unexpected check is suffered, such as an unreasonably high fuel cost level, there is every reason to believe that ultimately the truck industry will equal, if it does not exceed in size, the present day passenger car business. And to do that it must expand from a yearly production of 70,000 trucks to one of 1,000,000 machines.

## MORGAN & WRIGHT EXPANSION.

Morgan & Wright have purchased additional land between Jefferson avenue and Detroit river, adjoining its Detroit plant. The plot is 400 by 700 feet and is at present partly occupied by the works of the Michigan Steel Boat Company and partly by the King Motor Car Company. The new building will be used to provide additional storage facilities.

## VIM COMPANY DINES DEALERS.

### New England Agents Organize at Banquet Held During Boston Show.

An association of the dealers in Vim trucks was organized during the Boston show as the result of a dinner that was given to the selling representatives by the Vim Motor Truck Company, through C. E. Wheeler, the New England district sales manager. The event took place the evening of March 8 at the Hotel Westminster and was attended by a company of about 35, the dealers having gathered at Boston to visit the exhibition, give attention to their own personal prospects and to confer with Mr. Wheeler relative to policies, selling plans, etc.

Director of Sales Wayne W. Light came from Philadelphia to attend the dinner and meet the dealers personally, and with Mr. Wheeler represented the company. The dining room was specially decorated and there was a special menu, the card bearing the inscription "Vim Boosters' Dinner," and the phrase "With Vim and a Boost, Results Are Produced." The guests received as souvenirs handsome leather pocket cases that were appropriately inscribed.

Mr. Wheeler acted as toastmaster, and the principal address was made by Mr. Light, but a considerable part of the evening was given over to business—the discussion incident to the formation of the New England Vim Dealers' Association and determining plans for future activities. Some of the dealers made practical suggestions as to the manner of meeting, the results to be obtained from co-operation, and much enthusiasm was developed. The meetings of the association will be held frequently at places that can be

conveniently reached, and the endeavor will be to promote the business interests of all the members.

The membership in the association includes the following: A. F. Donigan, Bingham, Me.; Bangor Motor Company, Bangor, Me.; Merrill & Hinckley, Blue Hill, Me.; H. C. Lintett, Nashua, N. H.; Luther G. Kent, Randolph, Vt.; Millard's Garage, Sharon, Mass.; the Fiske Corporation, Natick, Mass.; Philip T. Bibeault, Lowell, Mass.; S. D. Pierce, New Bedford, Mass.; Fred T. Wiley, Newton Centre, Mass.; G. R. Briggs, Bourne, Mass.; Harrington-Gifford Company, Springfield, Mass.; John T. Sharkey, Taunton, Mass.; F. S. Howard Motor Company, Worcester, Mass.; William F. Lunt, Newburyport, Mass.; Frank F. Wunson, Gloucester, Mass.; Benton Motor Car Company, Haverhill, Mass.; Place Garage, Fall River, Mass.; Ernest S. Richardson, Danvers, Mass.; White Motor Sales Company, Danvers, Mass.; Vim Truck Company, Boston, Mass.; Lake Auto Agency, Danbury, Conn.; J. B. Gatchell, New London, Conn.; Preusser & Son, Norwalk, Conn.; Selden Truck Sales Company, Hartford, Conn.; John L. Carpenter, Bridgeport, Conn.; C. H. Minchin, Greenwich, Conn.; Kirk's Garage, New Haven, Conn.; Bellows Falls Garage, Bellows Falls, Vt.; E. H. Russell, Burlington, Vt.; Vim Truck Sales Company, Providence, R. I.; Philip F. Conroy, Newport, R. I.; Frank Crook, Pawtucket, R. I.; Payson Motor Company, Portland, Me.

### WOULD CHANGE HIGHWAY COMMISSION.

Representatives of the American Automobile Association, the Highway Safety League and the Safe Roads Automobile Association have appeared before committees of the Massachusetts legislature to urge the formation of a motor vehicle commission to take over the licensing of cars and drivers and all matters pertaining to vehicles and that the highway commission be restricted to work on highways. They urged also that all highway work in the state be taken away from the towns and control of it lodged in a central board. This, they maintained, was sure to arouse opposition because of local and personal jealousies.

Col. W. D. Sohier, head of the Massachusetts Highway Commission, opposed the formation of a separate vehicle commission on the ground that the existing body was doing as much work in the vehicle department as is done in any other state and all that it is practical to do.



The Founders of the New England Vim Dealers' Association at Dinner at the Hotel Westminster, Boston, During the Motor Truck Show.

## DEPARTMENT STORE SHIPPING ECONOMY.

### How the Use of Motorized Equipment Has Caused the Transformation of the Systems and Organizations and Expedited the Service in Greatly Increased Areas.

**T**HE use of motor trucks by department stores has become so general that practically every large city store of note has some power equipment, only 12 per cent. of the smaller city stores are entirely without motor vehicles, and the ratio of machines to horse

in the last two or three years have been designed around the shipping room, instead of leaving that important department more or less to chance.

The whole tendency of city development points to far greater utility for the truck in the future than in the past. Formerly the well-to-do and comfortable lived in the cities at distances not far removed from the stores. But all over the country of recent years many of this class have sold their city homes, which then became boarding or rooming houses, and built new residences in the suburbs.

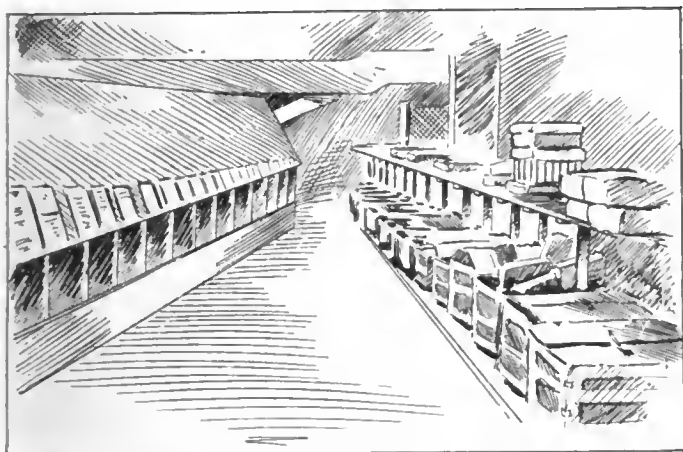
#### Best Customers in Suburbs.

This means that the best and most profitable business comes now from the suburbs instead of from the neighborhoods surrounding the store. This custom has moved out of the radius of horse delivery and made the truck, with its quicker work on long hauls, indispensable for delivery.

But the truck used by the same loading methods that formerly sufficed for horse equipment, often showed no great economy, or even cost more to operate. So conditions are forcing an up-to-date inside system upon merchants.

The department store, like most others, has never been able to obtain an entirely even volume of business, but is subject to peak loads. These peaks occur in October at the beginning of the fall and winter buying season, at Christmas and at Easter. During the week business is always heavier just before a holiday and often also at the end of the week rather than at the beginning.

It is in caring for these peak loads that the ordin-



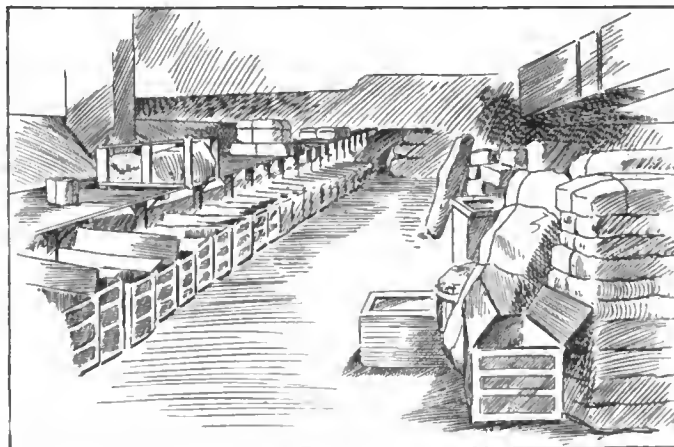
The Combination Parcel Receiving Bins and Sheet Writing Desks of the Filene Store at Boston, Mass.

wagons is rapidly increasing wherever they have been adapted.

This use of trucks is transforming the entire delivery systems of the stores that have them in service. The changes have made necessary equally complete transformations of the inside systems of handling packages before they are loaded on the vehicles, and it is safe to say that no architect will now undertake to plan a department store building without taking the greatest care to provide facilities for quick and easy loading of motor vehicles, as well as the quickest way of getting the packages assembled and assorted for the routes so that every truck will have a minimum of stopped time at the store.

The older stores built when horse delivery was the vogue, had no special facilities for quickly loading the wagons. They are, or were, provided with sidewalk elevators or special doors, and the wagons are loaded slowly while the horses were resting at the sidewalk or in an alley. It has in many cases been found to be very difficult to adapt the truck efficiently to a primitive loading system of this kind. The truck demands something far more intelligent and better developed.

It is significant of the great value of the truck as an economizer that the most progressive merchants of the country have found it worth while to change their systems, and even remodel their stores in many particulars, to take advantage of the best economy that trucks can afford them. Practically all the stores built

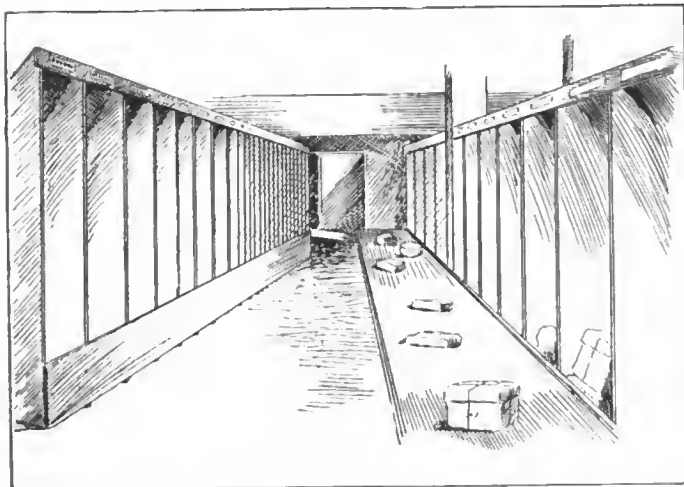


The Carriers and the Stands for Receiving Large Parcels at the Filene Store Shipping Room.

any delivery system is most likely to show its weaknesses. With regard to the outside delivery there are several ways of meeting the situation. One is to hire



additional trucks or horse wagons during those seasons, or to turn over the packages to the postoffice or the established express companies. If the peak load is

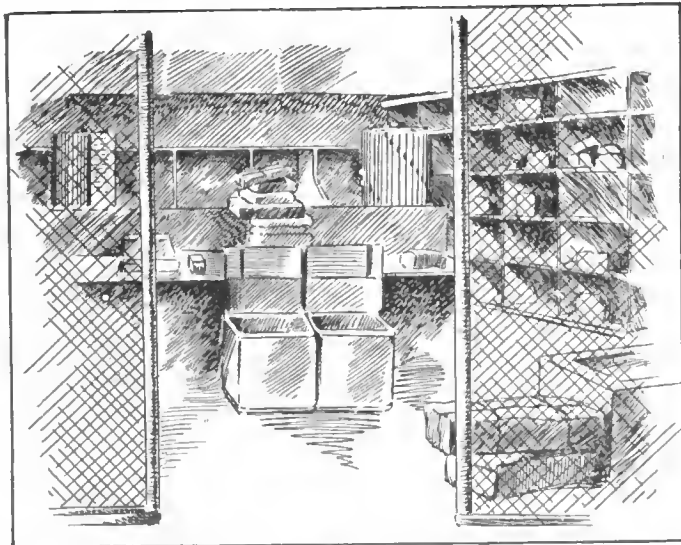


**Method of Distributing Packages from a Belt Conveyor Between Two Series of Bins at the Filene Store.**

very much greater than the average load, one or both of these methods may be absolutely necessary.

But many of the large stores are able to take care of the extra delivery service required at such times with their own equipment. This necessitates that they maintain about a fourth more equipment all the year around than they can use in the slack seasons.

Yet many have found that it pays to carry the extra trucks. Some stores operating 80 wagons or so own 20 more than they use in dull periods. This enables them to put every truck they own into a repair shop for a complete overhaul once a year. These overhauls are arranged so that they are done in the summer as a rule and when the peak loads are on, all of the trucks are working. Owing to the better condition in which the vehicles are kept the operators of the



**The Charge Room at the Filene Store, Where the Packages Are Examined and Accounts Verified Before Distributing.**

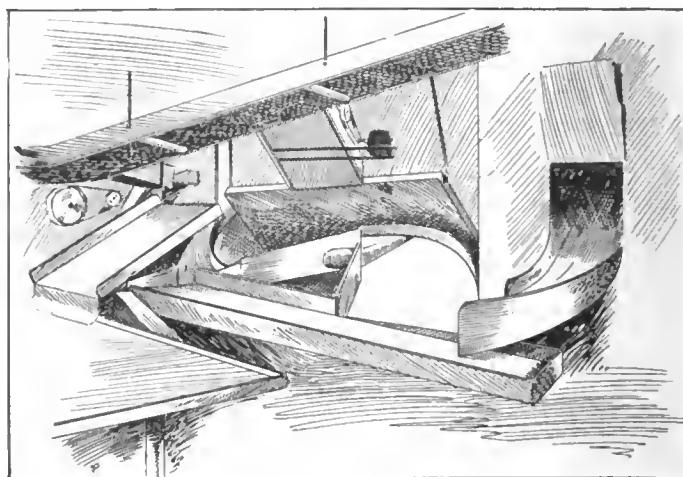
stores find as soon as this system is established that there is a tremendous reduction in the number of delays from mishaps to trucks while they are on the

road, which means economy and better service.

A truck delivery system can much better meet the demands of the peak load without using extra vehicles than horse delivery ever can. A truck can be manned with extra helpers or jumper boys to make the house to house deliveries and can work any amount of overtime. With it a crew can easily accomplish under pressure twice the work that it would ordinarily do. With horse wagons, even when horses are changed in the middle of the day, this additional work is not possible.

The great advantage of a good internal system for handling packages is that it keeps the trucks on the road working all the time and increases the work they can do. It also reduces the amount of inside help that must be employed, eliminates confusion, cuts down breakages and requires less floor space to handle a given number of parcels.

Under the system that was quite generally the vogue in the old horse wagon days, cash girls carried packages to the wrapping desks, where the bundles



**The Central Point in the Store of the Jordan, Marsh Company, Boston, Where the Packages Are Distributed to Conveyors.**

were loaded into roller basket carriers, taken to elevators and lowered to the basements. There the parcels were dumped into piles and sorted and routed, some times by the driver himself. Meantime the horses munched their oats and rested.

Such a system in times of rush caused a great deal of trouble. For the most part the elevators used were attached to the bottoms of the passenger elevators and the baskets had to be moved through the store aisles, which might be crowded with customers. The greater the rush the more these baskets added to the inconvenience and congestion.

#### **Spiral Gravity Chutes Employed.**

The new inside systems which have been developed almost simultaneously with the utilization of trucks for department store work operate much more smoothly. Spiral gravity chutes for packages lead from various parts of the stores to the shipping rooms.

They are sorted at the end of these chutes to separate the paid packages from the C. O. D. and charge



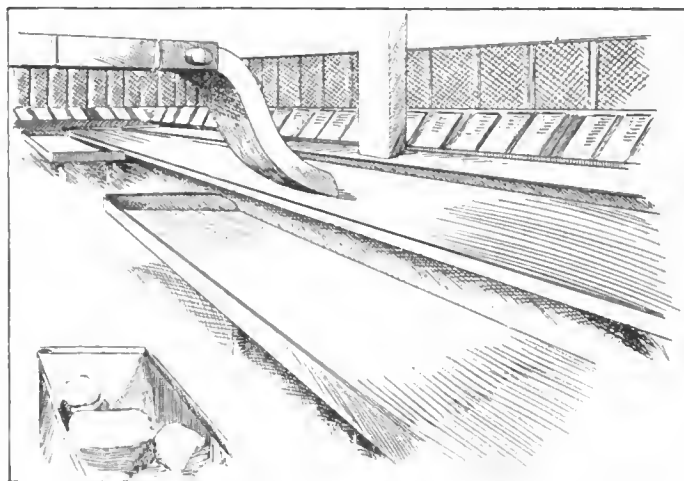
purchases. Each sort is then placed on another chute or a belt conveyor and sent to that part of the shipping room where such packages are cared for.

Those that are moving toward the wagons next come into the hands of dispatchers at the end of the belt conveyors. These men know the city very thoroughly and can tell by a glance at an address which route it will be delivered on. They mark the numbers of the route on the packages and place them on other belt conveyors.

These conveyors pass down aisles, on each side of which are large bins numbered to correspond with the various routes. Boys stand beside the conveyors and note the route marks on the packages as they come along. They take the parcels from the conveyors and place them in the bins of the routes for which they are marked.

There are doors at the opposite ends of these bins, another aisle and on the other side another set of bins.

in extreme high rent districts, where the owners feel that they cannot afford the space required by an elaborate shipping room.



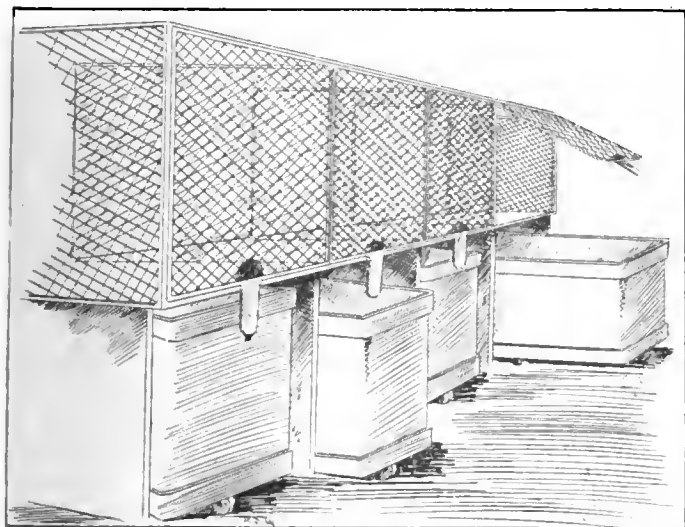
How the Desks for the Sheet Writers of the Delivery Department Are Arranged in the Jordan, Marsh Company's Shipping Room.

In one large store in Pittsburg parcels are placed in great hampers at the store and carried on heavy duty trucks to a garage in the low rent district, where a shipping room is efficiently equipped, where they are routed and sorted, in a way similar to that described.

Owing to the great territory which is tributary to the Boston department stores, they have never attempted even to handle all of their dull season delivery with their own equipment, but have, instead, relied for a share of their deliveries on express companies, the postal system and parcel delivery companies.

#### A Boston Shipping Installation.

The shipping room of the Filene store is one of the modern type. It is in the sub-basement and occupies the greater part of that section of the store. The packages are collected on each floor and sent by spiral chutes to the shipping room, where they are received on a conveyor belt. A conveyor belt runs down the



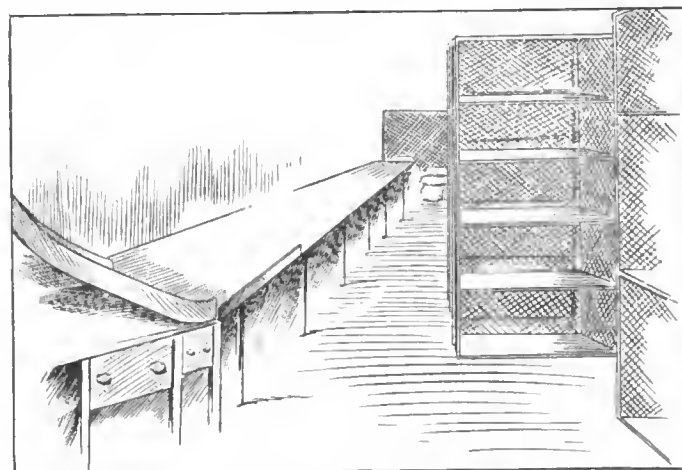
Tills in the Shipping Department of the Jordan, Marsh Company's Store with the Parcel Carriers Locked Beneath Them.

In this aisle between the two rows of bins are stationed men with sheets. They write down a description of each package on their sheets and transfer them from the first row bins to the second row bins at the same time.

In the second row bins there are large basket carriers on rollers and when the drivers arrive they take these carriers and load their contents into the wagons, checking the parcels at the same time against the lists with which they have been provided.

Such a shipping room as this is usually in the sub-basement of the store, and in some of the newer stores driveways into these basements have been provided, so that the trucks can be brought in and loaded. In the case of one very large New York store, which recently occupied a new building, the drivers' bins are on a platform to which the electric trucks are backed and in the side of the platform are electric plugs, so that the charges in the batteries of the trucks may be "boosted" while the loads are being taken on.

Many of the stores in the centre of cities are located

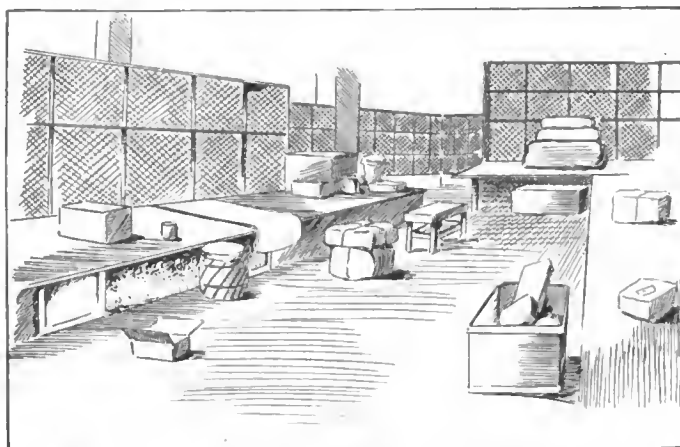


A Section of the Transfer Room of the Shipping Department of the Store of the Jordan, Marsh Company.

centre of the room and at the right of the belt is a high bench under which are basket carriers.

Beyond is a series of bins or compartments beneath

a top which is inclined to either side at an angle of 45 degrees. This serves as a desk on which the drivers' sheets are made out. At the end of the long belt is an-



Another View of the Transfer Room of the Jordan, Marsh Company's Shipping Department.

other running at right angles between two rows of bins. The row of bins at the right side is for packages to be delivered by the store's own equipment, and that at the left for the local express companies.

After the records have been made out the bundles are placed in the baskets ready for the drivers. At the end the conveyor makes a turn toward the right and the charge bundles which have been left on it are carried to the charge room. Here they are entered on sheets and placed on another belt that takes them to the packing room. Here, with the parcels from the packing room, they are placed again on the main belt and distributed to the bins, from which the drivers take them.

"City" delivery is made for this store by the Boston Parcel Delivery Company, while in a number of suburbs—in Boston the more important neighborhoods from a business standpoint—the company itself operates a fleet of motor delivery wagons. Outside of this area delivery is made by express and parcels post.

From the drivers' bins the parcels are taken in roller carriers by sidewalk elevators to the outside of the building, where they are loaded.

#### Highly Organized System.

The delivery system of the Jordan, Marsh Company is one of the best organized in the country. The store has nine packing rooms and collection of packages is made every 15 minutes or less. Spiral chutes carry the packages to the basement. They arrive at a station where the charge bundles are sorted out, and the address and responsibility of the customer verified by card indexes. The bundles are then placed on a belt conveyor and taken to the shipping room. Here they are sorted and placed on belt conveyors leading to the different divisions.

To one room is sent the packages that are to be delivered by the company's own equipment, to another the local express packages, and to a third the general express and parcel post packages. A fourth is for the

collection of packages purchased by "transfer."

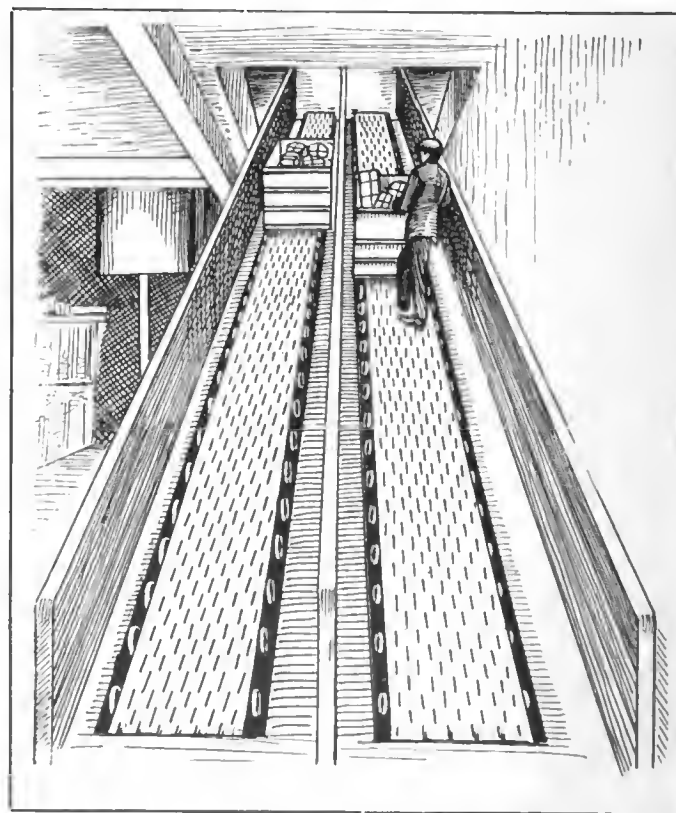
Other rooms are used for packing transfer purchases, examining bundles returned for refund and for clerical work. The equipment of the shipping room cost \$75,000. The store delivers from 3,500,000 to 4,000,000 packages a year at a cost of seven cents a package, which is lower than that of other Boston stores because of the larger volume.

In the shipping room the packages are collected in compartments surrounded by grating. From these compartments the roller carriers are taken to the elevators, which take the packages from the shipping room to the street. There they are loaded over the sidewalk. The street is narrow and often crowded, which makes loading difficult. The parcels are checked and sorted as they are loaded and there is no shelter provided except that of an awning.

Modern inside systems with mechanical conveyors for handling packages have aided much in speeding up the work of the trucks, but department store delivery experts realize that these methods are robbed of much of their effect as long as packages have to be taken to the street in an elevator and loaded over the sidewalk.

#### The Store of the Future.

The department store of the future will have a space in the shipping room or adjoining it, where packages may be placed in the wagons in the least possible time. It is beginning to be realized that in new stores



An Escalator Designed for Conveying Wheeled Parcel Carriers from Basement Shipping Rooms to the Street Level for Loading.

facilities and equipment that will insure the highest efficiency of the trucks will soon pay for itself, and it is more than likely that many of the older stores will be

remodelled to effect the same purpose.

One of the newest stores in New York is of the most modern type. Provision for the shipping room was made first and the rest of the building was designed around it. This store has its shipping room in the basement and there are inclined runways by which the wagons and trucks can enter the basement and load directly from the bins. Where space is too expensive at the main store, the same effect can be secured by placing the shipping room in a separate building in the low rent district, but in that case the cost of transferring the goods to the shipping room is added, and may in many cases be greater than having a shipping room in the main building. The added expense includes also additional shipping room help to check in the second building the packages that have been received from the main store. It also requires a longer time from the hour of purchase for a package to be delivered.

Where a truck can be loaded at the shipping room itself the driver and his helper and a man, whose business it is to assist with the loading, can put a load on the machine very quickly.

Where there is no possibility of running the truck directly to the shipping room the most efficient manner is to build a loading bay under the building on the street level. Here the trucks are withdrawn from the street traffic so that passers-by on the sidewalk cannot interfere with the loading.

It is generally agreed also that much the best manner of getting the roller carriers from the basement shipping room to the ground level is the escalator rather than the elevator. In the case of the latter much time is lost waiting for the elevator to arrive and it is never possible to send a carrier up or down unattended. With the escalator it may be pushed aboard and will convey itself safely unattended to the level above.

#### RUBBER MANUFACTURES IN 1914.

One of the greatest increases in the business reported by the United States Census Bureau is that of the rubber industry, which in 1914 made \$300,251,827 worth of goods in 331 establishments, as compared with \$197,394,638 production in 267 establishments in 1909 when the preceding industrial census was taken. The increase in five years is \$102,857,189, or 52.1 per cent.

The production of rubber tires in 1914 was valued at \$146,411,692 and formed 48.8 per cent. of the total value of rubber goods manufactured during the year. No figures on tires were taken in 1909. The solid tires

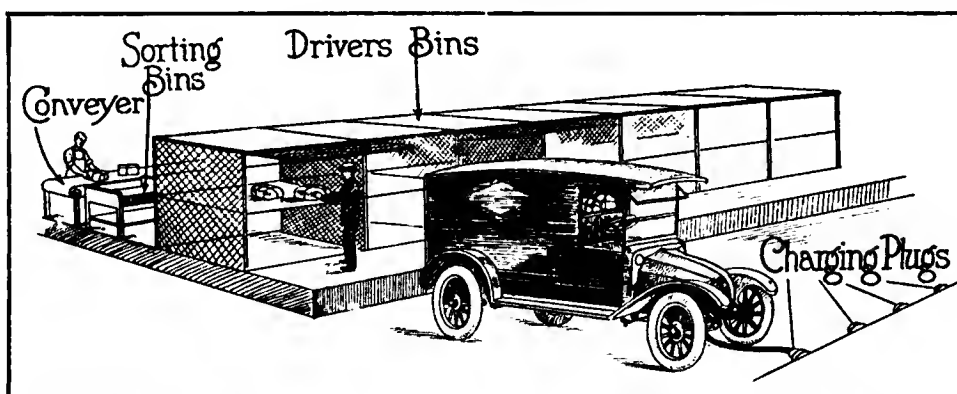
for motor and other vehicles produced were valued at \$13,735,681 in 1914. There were made 8,020,815 casings for pneumatic tires, valued at \$105,671,223, and 7,906,993 tire tubes, valued at \$20,098,936, were made in the same year.

#### KISSEL CHANGES POLICY.

That the Kissel Motor Car Company, Hartford, Wis., is to give more attention to the development of its truck department is shown in the recent announcement of a new  $\frac{3}{4}$  to one-ton worm drive KisselKar truck.

George A. Kissel, president of the company, says that the truck industry is on the eve of great forward strides as sensational as those that have marked the progress of the pleasure car. "The experimental stage," he says, "has been passed—trucks are built scientifically right. The educational stage is passing—most business men who have haulage to do know that a good truck will save them money."

Mr. Kissel also says that he believes the  $\frac{3}{4}$  to one-ton truck to be the most popular seller and that his



The Shipping Room of a New York Store in a Sub-Basement, Where the Wagons Are Loaded at the Bins, Minimizing Handling.

company has planned for a large production of this size of chassis.

#### PACKARD'S TRUCK DEVELOPMENT.

Producing 25 motor trucks in 1908, the Packard Motor Car Company's annual output had grown to 4411 in 1915. To keep up with this increase the factory facilities necessarily have been developed accordingly. As an instance, the steel for the truck frames is unloaded direct from freight cars into the frame erecting shop and is then carried by powerful cranes to the various machines for manufacturing operations. Castings and machined parts for the working units are handled similarly. The various parts are sent through the processes so that they come out at a common centre and ready to be assembled into complete trucks. The Packard truck plant is one of the best systematized in the country and now comprises seven buildings with a combined floor space of 315,099 square feet. In 1908 there were 75 employees; in 1915 there were 1802.

## LOW TRUCK OPERATING COST.

### Packard Worm Driven Machine Shows Surprising Result for Year.

The actual cost of operating a five-ton and a six-ton Packard motor truck has been recorded for a period of one year, from Sept. 1, 1914, to Aug. 31, 1915, by the Roehm & Davidson Company, dealer in steel and iron, at Detroit, Mich. These figures show that both trucks covered a mileage of 18,550 miles, hauled 9723 tons at a cost a day of \$6.90 for the five-ton truck and \$7.70 for the six-ton vehicle. The cost a mile were 22.75 cents and 24.70 cents respectively.

The year included 307 working days, and in the matter of the five-ton unit, to which the following figures apply, the total mileage was 9174; the average daily mileage was 29.8, 2373 gallons of gasoline were consumed and 3.8 miles to the gallon were made. In lubricating oil 142.9 gallons were used, at the rate of 64.2 miles to the gallon.

Depreciation was estimated at \$3.92 a day (\$1203.44 the year), the figures being based upon the life of the truck, costing \$4704, less tires, being placed at four years of 300 working days each.

Interest was figured at 47 cents a day (\$144.29 the year), it being based upon six per cent. on average valuation of half of the first cost, less tires.

Insurance was placed at 30 cents a day (\$92.10 the year) and covered fire, property damage and liability.

Tires were estimated at 46 cents a day (\$141.22 for the year), which is the actual cost, as determined after replacements.

Maintenance and garage costs were placed at 79 cents a day, or \$240 for the year. This was estimated as follows: Twelve months at \$20 each. This charge is arbitrary; during the five months of the winter the truck is housed in a public garage, while during the rest of the year it is left outside of the plant. The driver and helper do the oiling and washing. The actual cost for the year was \$133.47, and the additional charge of \$106.53 is allowed to accumulate as surplus for overhauling at some future time.

The gasoline cost for a day was 95 cents, or \$261.03 for the year, 2373 gallons being used. An average price of 11 cents a gallon was set on this item.

Averaging the cost of the 142.9 gallons of lubricating oil at 25 cents, the daily cost was 11 cents and the yearly charge was \$35.73.

Footing these items it is found that total machine cost a day, less the charges for driver and helper, was \$6.90, while the cost for the year was \$2117.81. However, the Packard company states that Mr. Roehm admitted that his depreciation charge is larger than it should be. It is pointed out that if the computation were made on the basis of a life of 100,000 miles (many Packard mileage records show 150,000) the depreciation charge would be 4.704 cents a mile, \$1.40 the day

and \$431.55 for the 307-day period, instead of \$1203.44 as charged in the Roehm & Davidson tabulation. Therefore, the daily cost of the machine should be reduced by \$2.52.

If these figures were followed throughout the life of the truck (100,000 miles) the cost would be decidedly lower than is usually estimated for a vehicle of this capacity. This would mean that the operating cost would be, less the wages of the driver and helper, \$4.38, and the machine would be charged enough so that at the expiration of the period of service there would be a sufficient amount accumulated to replace it.

## FEDERAL TRUCK FIGURES.

The annual report of the Federal Truck Company for the fiscal year ending June 30, 1915, shows a production of 1588 trucks. The gross receipts were \$2,319,000 and the net profits \$558,000. This compared with a production of 750 trucks in the previous year, gross earnings of \$1,009,000 and net profits of \$197,000, is a very large gain. The net earnings for 1915 were \$696,950, of which \$138,000 was set aside for depreciation. At present the company is turning out 12 trucks a day and work is being rushed on the completion of a new addition that will increase the capacity to 15 trucks in a day. The company expects to turn out not less than 3600 trucks during the current year.

## MOTOR 'BUSES IN ST. LOUIS PARK?

St. Louis has an art museum in Forest park which is a mile from the nearest trolley line. Last fall Park Commissioner Cunliffe experimented with double-decked motor 'buses, and after a few days' operation reported that the city could buy enough 'buses to take care of the service for \$25,000, and that they would be self-sustaining at a two-cent fare. The St. Louis Art League disapproved of the report and recommended that a trolley line be built. The cost of the proposed trolley line is estimated as from \$70,000 to \$229,000, and would entail a free transfer by the street railway company. Opponents of the trolley line hold its heavy cost against it.

## SERVICE COMPANY INCREASES CAPITAL.

The capital stock of the Service Motor Truck Company, Wabash, Ind., was increased at a recent meeting of the stockholders from \$250,000 to \$450,000. The new issue has practically all been subscribed for by the present stockholders. This increase was made necessary by the growing sale of Service trucks. Two large additions to the factory have just been completed, which practically double the capacity, but the directors of the company anticipate that this will not be large enough to take care of the business and are planning the erection of a new plant.

## KNOX WINCH-EQUIPPED TOWING TRACTORS.

**T**HE Knox four-wheel tractor designed for use with semi-trailers of various types has now been supplemented by a new winch-equipped, four-wheel tractor, which is used exclusively with four-wheeled trailers.

The special feature of this towing tractor is a very powerful winch, which is attached to the rear of the tractor frame. This is equipped with 150 feet of cable. It is driven from the transmission gearset through a propeller shaft and two universal joints to a worm and gear on the winch shaft. The winch drum is loose on the shaft and is driven through a clutch, which may be released by hand when it is desired to reel off the cable rapidly. With the motor running 1000 revolutions per minute the cable is hauled in at the rate of 40 feet a minute.

When the driver desires to operate the winch it is necessary to anchor the tractor so that it will not be pulled backwards. This is done with a heavy sprag, attached to the rear axle, which may be dropped quickly into position. When it is not in use this sprag is carried well out of the way.

### Can Tow in Either Direction.

Arrangements have been supplied so that the tractor can tow in either direction. At the rear of the frame a large forged steel towing hook is attached and a heavy buffer spring is fitted to absorb the shock of sudden starting. An automatic locking device prevents the escape of the chain or ring. Two hooks are also supplied in front. They are twisted and can be used either for towing backward or making fast an additional sprag to anchor the tractor.

The tractor chassis is designed to carry in its own body—which may be of any type that is desired—a weight of from two to four tons, thus assuring effective traction for the rear wheels.

The tractor is fitted with the usual solid rubber tired wheels, but if desired steel wheels with heavy cleats on the tires may be had at an additional cost either as extra or substitute equipment. The steel wheels are for use under exceptionally bad road conditions.

### Designed for Heavy Service.

The towing tractor is intended for use when haulage is very difficult, as for instance, when necessary to haul a heavily loaded four-wheel trailer or train of trailers over rough or soft ground or up a steep gradient.

The trailer wheels can be blocked on a grade and

the tractor run ahead a distance equal to the length of the cable carried by the winch, which is 150 feet. The tractor is then anchored by dropping the sprag and the 20,000 pounds of draw bar pull exerted by the winch used to haul the trailer up. On bad road surfaces the winch may also be used to pull the tractor or trailer up on to solid ground when either has become mired.

### Winch Is Useful Equipment.

The winch is also useful for numerous other work in connection with heavy hauling. In lumbering the winch can be used to pull heavy logs or timbers into place preparatory to loading. Contractors find the winch useful in wrecking a building or hoisting heavy material. The tractor is very serviceable in hauling military supplies or guns through poor roads.

Except for the additional features which adapt it



**Model 36 Knox Winch-Equipped Towing Tractor Fitted with Steel Wheels and Cleated Rims for Service on Soft Surfaces, Poor Roads or in Fields—This Machine Is Especially Adapted for Military Use.**

for use exclusively with four-wheeled trailers, the towing tractor is built from the same specifications as the standard tractor.

One of the special features of both types is the Knox hydraulic brake, which is patented. The brakes are operated by a hand lever and are of the internal expanding type. The braking power is applied through the interior of two heavy drums 20 inches in diameter and of 6½-inch face. These are secured to the rear axle and the driving sprocket is a part of the same drum.

### The Hydraulic Hand Brake.

The hydraulic pressure of the brake is transmitted by a flexible pipe from the pressure pump in the driver's cab to the cylinder on the rear axle, which operates the brake shafts. The rear axle may move as it pleases with reference to the chassis without affecting in any way the adjustment of the brake.

Three or four quick strokes of the pump are suf-



ficient to bring the expanding brake drums in contact with the drums attached to the axle. The ratio of the hydraulic pump plunger and of the brake band plunger is 10 to one, enabling the driver to exert a large braking force on the driving axle. This pressure is maintained until the handle of the hydraulic pump is moved forward, beyond the stop of its ordinary travel, when a valve is released, allowing the liquid, either water or oil, according to the season and climate, to flow back in the reservoir and permitting the springs to draw the brakes out of contact.

#### **The Differential Gear Lock.**

Another feature is the interlocking differential lock. If either driving wheel slips on soft or uneven road surfaces the two wheels can be locked together so that all the power will not be transmitted to the slipping wheel.

The driver presses down a lever in his cab. This is interlocked in such a way that the transmission gearset is thrown into neutral, so that the spinning wheel is stopped. The differential locks and the driver

which was originally used is not now sufficient to care for the traffic.

The changes in character of traffic during the past three years, as shown by careful studies, is remarkable.

The runabouts have increased in three years from 37.2 to 82; touring cars from 173.5 to 380; trucks from 11.5 to 38; and the total of motor vehicles from 222.2 to 500. Horse drawn vehicles of all kinds have decreased 129.4 per station per day to 106. This indicates that the increase in motor vehicles has been much greater than the decrease in horse vehicles. This is accounted for to some extent by the growth of the communities along the roads, but much more perhaps by the fact that automobiles are taking thousands of people over the roads who formerly made no use of these vehicles. The motor car has greatly increased the use of the roads, as well by the development of long distance deliveries of goods that formerly were sent by train or were not purchased at all.

#### **SELECTING ROCK FOR ROADS.**

Hardness, toughness and binding quality are the three essentials of rock that should be sought in material for building water bound macadam roads, according to a bulletin just issued by the United States Department of Agriculture.

Hardness is necessary to resist traffic, especially that which travels on steel tires and which tends to grind to dust the rock in the surface coating. Toughness is necessary to resist breaking under the impact of traffic. Binding power is the quality possessed by the rock dust to cement together the larger fragments of the rock.

To insure proper selection for hardness the department offers to test rock free for any citizen provided it is sent post paid in accordance with certain instructions, which will be mailed on request from the Office of Public Roads. This testing is done also for road officials and will insure the selection of a rock that will withstand wear. The department has elaborate and expensive laboratory apparatus with which rock may be tested for all its useful qualities.

#### **NEAL IN SIGNAL TRUCK COMPANY.**

Thomas Neal, formerly president and chairman of the executive committee of the General Motors Company, has been made a director and elected chairman of the executive committee of the Signal Motor Truck Company. This company recently increased its capitalization from \$85,000 to \$550,000. He will retain his connection with the Acme White Lead and Color Company. Myron W. Neal, treasurer of the Acme company, and W. K. Hoagland of Allerton, Greene & King, Chicago bankers, were also elected to the board of directors. The other members are A. C. Church, John Squires and Murray Wendell. The Signal company is to have a new plant on East Jefferson avenue, near the Chalmers factory.



Rear of Knox Model 36 Winch-Equipped Towing Tractor, Showing the Sprag for Anchoring the Machine for Cable Haulage on Steep Gradients.

can throw in any speed he desires to use.

The Knox tractor series now includes the regular model 35 for semi-trailers in all sorts of hauling, the same tractor adapted to fire department use, and the model 36, as the towing winch tractor is designated. The three machines are being marketed through the Knox Motor Associates and their dealers. The organization has been expanded steadily and distributors are now located in the principle cities of the country. Strong foreign representation has been secured and many of the tractors have been sold for commercial use abroad as well as for military hauling.

#### **MASSACHUSETTS TRAFFIC CENSUS.**

The state roads built in Massachusetts from 10 to 20 years ago are rapidly wearing out, according to Chairman Sohler of the State Highway Commission, and they will have to be resurfaced with some more durable material to stand the heavy modern automobile traffic and widened much, as the 15-foot standard

## MOTOR FIRE APPARATUS.

### Large Economies Obtained with Its Use in New York City

The motorization of the New York City fire department, as shown by a recent report of Fire Commissioner Adamson, began in 1908, when the first hose wagon was bought. In 1910 six more similar wagons were purchased, one motor propelled steam fire engine and a tractor for a water tower. In 1911 20 pieces were bought; in 1912, 88; in 1913, 29; in 1914, 76; in 1915, 93. This was a total of 315 for the eight years.

The various types of apparatus now in use include: Tractor drawn steam fire apparatus, self-propelled pumping engines, tractors for engines and hook and ladder trucks, hose wagons, water towers, chief's cars, fuel wagons and rescue squad wagons.

The greater speed makes response prompter on longer runs and insures that equal protection is given the city by a smaller number of companies. Every first alarm fire in a closely built-up section would result in a conflagration if it were not extinguished, and second alarm fires result from flames having gained too much headway before the arrival of apparatus.

An engine drawn by horses weighs between 10,000 and 11,000 pounds and a 75-foot aerial truck weighs from 11,000 to 12,000 pounds. Such a great weight is too much for even the fire department horses to make good speed with. The best horses begin to slow up perceptibly after travelling a half-mile at top speed. On third or fourth alarm fires it often takes a long time for the horse apparatus to reach the scene and meantime the fire is gaining headway rapidly.

The result is that third and fourth alarm fires are becoming much less frequent in districts that are covered by motor apparatus. A motor can be operated and maintained for \$414.60 a year, while the expense of the three horses which it replaces is about \$900. Taking the companies as a whole the cost of maintaining the motorized units has been found to average \$817.26 less per year than that of those using horse drawn apparatus.

Large savings are also made because of the smaller buildings and reduced real estate investment that is required when motor apparatus is in use.

## MOTORCYCLE MAIL COLLECTION.

The Postoffice Department is experimenting with motorcycle tri-cars for box collections for the post-office in Springfield, Mass., at night. Two tri-cars are used to cover the city. If the plan proves successful it will probably be extended to other cities of the same size throughout the country.

In three months the Atlas Ball Company will have moved into its new plant in Philadelphia and will have a capacity four times as large as at present.

## MOTOR EXPORTS RANK FIFTH.

### Are Only Surpassed by Four Other Classes of Manufactured Articles.

Exports of American motor cars, trucks and parts now rank fifth among manufactured articles. For the year 1915 the value of these shipments reached \$111,180,139, exceeding the combined exports of all other kinds of machinery, which reached \$81,224,345, and the combined exports of all sorts of steam and electric railroad cars and locomotives, carriages and wagons, bicycles, tricycles, stationary, marine and automobile engines, agricultural implements and electrical machinery, which totaled \$78,015,574. They also exceeded the value of manufactured cotton and cotton clothing, \$95,827,024; the manufactures of leather, \$75,268,680; chemicals, drugs and medicines, \$80,395,321, and wheat flour, \$96,201,234.

They were surpassed in volume only by iron and steel and the manufacture thereof, which amounted to \$338,703,720; by explosives, \$181,778,033; by refined mineral oils, \$138,689,495; by copper and its manufactures, \$125,136,289; by wheat, \$282,457,092, and by horses, mules, cattle and sheep \$121,641,231.

Inasmuch as the automobile industry draws very heavily on other industries for raw and partly finished materials, this summary prepared by the National Automobile Chamber of Commerce shows how greatly the automobile industry has contributed to the prosperity of the country.

In one year automobile exports have increased 232 per cent., or from a total of \$28,507,464 in 1914 to \$94,879,738 in 1915. Yet the home market remains tremendously larger than the export, as shown by the following figures of the number of machines taken during the year by the various countries: United Kingdom, 24,355, valued at \$35,055,097; France, 6304, valued at \$15,922,313; other Europe, 8630, valued at \$22,330,357; Canada, 5796, valued at \$4,622,931; British Oceania, 4818, valued at \$4,075,299; Asia and other Oceania, 4319, valued at \$6,728,813.

## TELEPHONE COMPANY BUYS WHITES.

Five 1½-ton White trucks have been ordered by the Southern New England Telephone Company. They are to be equipped with special bodies for telephone work. The order followed the purchase some months ago of one truck which was tried out in competition with several trucks of the same size.

## HUGEY IS PEERLESS AGENT.

By an arrangement with John R. Buck of the Pearson-Buck Motor Company of Chicago, William J. Hugey, for 25 years a designer of custom made bodies, has taken over the representation in that district of Peerless cars and trucks.

## HURRY CALL FOR ARMY TRUCKS.

### Government Buys Quick to Provide Transports for Mexican Expedition.

When the United States troops were ordered to Mexico bids were asked by telegraph on 54 1½-ton trucks to be sent with them as supply and baggage carriers. Orders were placed in two days with the White Company of Cleveland, O., and the Thomas B. Jeffery Company of Kenosha, Wis., for train loads of trucks, which were put under way almost instantly for the border in special trains which had the right of way over other traffic.

In addition to the 54 carrying trucks, two traveling repair shops were required, fitted with small lathes, drill presses, forges, bench vises and supplies of repair parts. In addition to this 15 motorcycles were ordered for use of corporals and messengers.

Civilian mechanics who were hired to go with the fleet were one truck master at \$150 a month, three assistant truck masters at \$125 a month; one mechanic at \$125, one assistant mechanic at \$100, and 27 drivers at \$100 each for each company. The regulation United States army truck body was used.

The Los Angeles Motor Reserve Corps of the California National Guard, which rapidly increased its membership as soon as the difficulty on the Mexican border broke out, was ordered to active duty March 15 for any service that might be necessary.

### TRAIN LOAD OF WHITE TRUCKS.

What is claimed to be a record shipment of motor trucks was recently made from the factory of the White Company, Cleveland, O., this consisting of 21 cars that were freighted with 54 machines consigned to dealers on the Pacific Coast. Trucks have been sold in such small numbers and so infrequently, even by the largest dealers, that the custom has been to have deliveries made by factory shipment after the order had been received.

This was not deviated from with this particular shipment, but the orders from the agents were received so rapidly that as a business proposition sending all of the trucks direct to San Francisco, whence those for other destinations could be transhipped north and south, one section being for Los Angeles and the other

for Portland, Ore., and Seattle and Tacoma, Wash., was advisable. The intention was to make the train a special, which would undoubtedly facilitate its progress.

Statement is made that this was the first exclusive train load of trucks ever shipped in this country for domestic delivery, although there may have been large numbers sent to New York and other cities for shipment abroad.

### HORSES DECREASE IN MASSACHUSETTS.

Representatives of the Massachusetts Protective Association for horses attempted to show a committee of the Massachusetts legislature recently that the number of horses in the United States per capita was the same now as it had been for 35 years. They said that in 1880 there was .21 of a horse per capita in the United States and that recent figures issued by the Department of Commerce showed the same ratio. Although 500,000 horses had been shipped during the past year to the nations at war, there has been a decrease of only 29,000 in the number in the country.

To offset this Col. W. D. Sohler, chairman of the State Highway Commission, declared that while the figures were undoubtedly accurate for the country as a whole, they failed to represent conditions in Massachusetts where they are far different. The number of horses in Massachusetts had continued to increase, he said, until 1908, when there were about 200,000. Since then the number has dropped to 150,000.

### SNOW REMOVAL CONFERENCE.

A snow removal conference was held in the assembly hall of the Automobile Club of America, New York City, March 8, under the auspices of the National Highways Association, the Automobile Club of America, the Citizens' Street Traffic Committee of Greater New York and the graduate course in Highway Engineering of Columbia university. The conference was opened with an illustrated lecture on "Modern Methods of Snow Removal" by William H. Connell, chief of the bureau of highways and street cleaning of Philadelphia. The proceedings of the conference will be published by the National Highways Association, of which Charles Henry Davis is president.



First Exclusive Train Load of Motor Trucks Ever Sent Out by Manufacturer to Fill Domestic Orders. En Route from White Company's Factory at Cleveland to Pacific Coast.

## TWO-TON TYPE ADDED TO STANDARD PRODUCTION.

**P**RODUCTION of a worm driven truck of two tons load capacity has been begun by the Standard Motor Truck Company, Detroit, Mich., which will be followed as soon as the plans can be developed by a somewhat lighter machine, which, while it will be 2000-3000 pounds load capacity, will be practically to the same design.

The Standard Motor Truck Company was organized with the purpose of building a single machine from high-grade components—in fact, the best that its engineers could select from the well known and established manufacturers of truck units—the belief being that concentration on one type would be a better business proposition than the production of several sizes, even to one standard design.

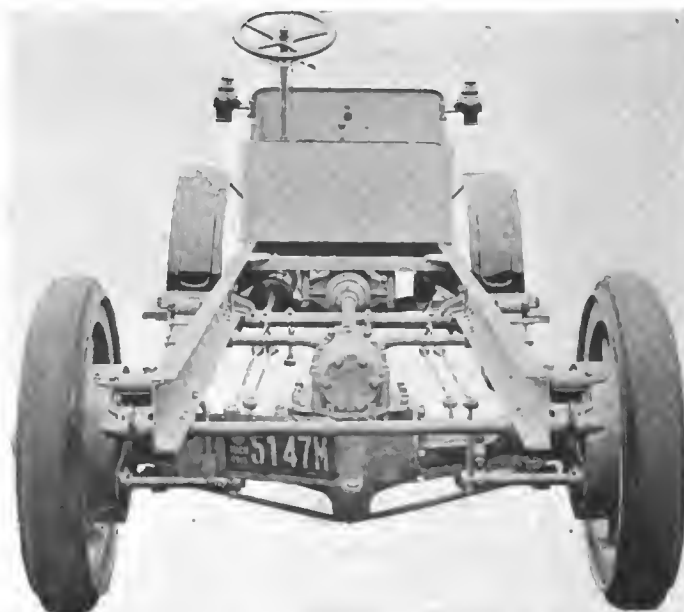
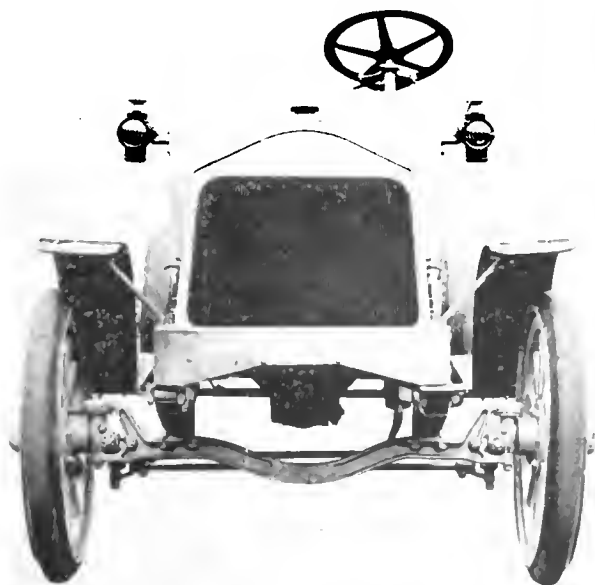
While this policy had undoubted merit, in that it standardized factory facilities and equipment, the serv-

that would meet with the haulage requirements of the largest number of prospective buyers.

The sales of the 3½-ton truck was extremely satisfactory. The service of the machines built proved the judgment of the engineers, and the experience was with practically every form of transportation. That the units were known to the general public and were a type that could be adjusted or repaired in the average garage or shop by workers who were not specially trained with reference to Standard trucks was a factor that strongly recommended the machines, and this knowledge insured a better degree of attention than might be obtained with vehicles not as well known.

### Third Worm Driven Truck.

The two-ton truck is the third worm driven machine that has been produced, the others being model 60 (3½-ton capacity), and model 80 (five tons capac-



The Standard Two-Ton, Worm Driven Truck Chassis: At Left, the Front of the Machine; at Right, Rear View, Showing Construction and Power Transmission System.

ice afforded by Standard machines was such that demand was made by owners of Standard trucks for vehicles of sizes other than was built, and this first impelled the construction of a five-ton truck, and later the plan for the two-ton vehicle was developed and perfected.

### First Truck Was 7000 Pounds Capacity.

The Standard chassis first built was 7000 pounds capacity, and the design was determined after careful study of the marketing possibilities of machines of this size and the probable results obtainable through the establishment of branches and agencies. The belief of the engineers was that there would be better realization of the service value of components that were made by well known manufacturers, that had been proven by actual experience to have endurance and could be operated with economy, and their problem was to combine the units decided upon into a type of machine

ity), while model 35, model 40 and model 50 are designed for loads of 3½, four and five tons, and are chain driven. With reference to the design, the chain driven trucks differ only in the size of the units and parts, and the same statement can be applied to the worm driven machines, but there is considerable difference between the chain and the worm driven vehicles. The trucks with chain drive have unit power plants that include the engine, clutch and transmission gearset, and the worm driven machines independent gearsets located in the centre of the chassis frame.

But the units are built by the same manufacturers. The engines are Continentals, the axles are Timken made, and all of the principal parts are designed and constructed by concerns that produce components for either type.

Model 70, the two-ton, worm driven chassis, is con-

structed with wheelbase of 140 inches and tread of 58 inches, with standard chassis length of 208 inches over all. The frame may be made a minimum length of 194 inches and may considerably exceed the standard for special requirements. The regular loading space of the standard chassis is 122 inches, the minimum 108 inches.

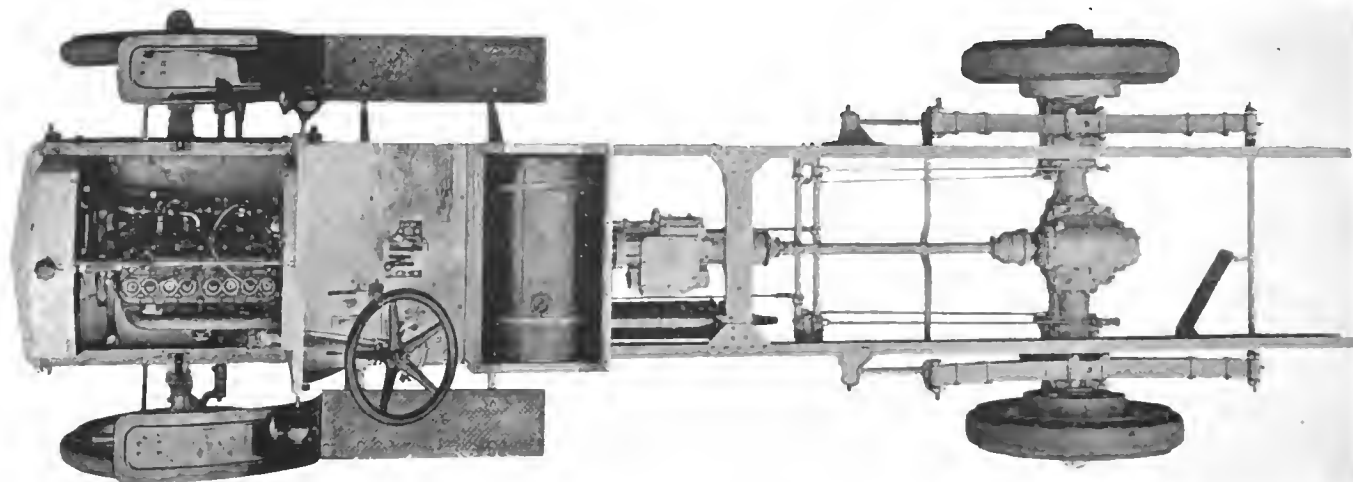
The engine of the model 70 truck is a unit with the clutch and this assembly is mounted on three points under the hood at the front of the chassis. The engine is a Continental model C, which is a vertical four-cylinder, four-cycle, water cooled, L head type, with the cylinders cast en bloc with the water jackets integral. The cylinder bore is  $4\frac{1}{8}$  inches and the stroke  $5\frac{1}{4}$  inches, this having an S. A. E. rating of 27.25 horsepower. The makers claim that this engine will develop approximately 40 horsepower at 1500 revolutions.

#### The Construction of the Engine Cylinders.

The cylinder block is cast from a special quality of gray iron and the design is intended to obtain endur-

play. The pistons are turned and finished by grinding to exact size. A series of oil grooves and three channels are cut in the external wall of each piston, the channels being fitted with  $3/16$ -inch eccentric expansion rings that are diagonally split. The rings are machined to relieve expansion stresses and are ground on the sides and faces to precise dimensions so that they may afford the standard compression. The accuracy of the diameters and the alignment of the holes for the wristpins are assured by boring the piston on special machines. The weight of each piston is noted and balancing is obtained by accurate tests.

The crank case is cast in two parts from an aluminum alloy, there being a transverse vertical web in the upper section that is the anchorage for the centre main bearing. The lower half of the case is divided by a horizontal transverse web in which are formed the oil troughs or pits of the chamber, and below this web is the oil reservoir. Extensions at the forward ends of the sections form the housing for the timing gearset



Top View of Standard Two-Ton Chassis, the Transmission Gearset Suspended Amidships, the Short Driving Shaft and Rear Axle and Springs and the Head of the Continental Engine.

ance in hard service. The head of the water jacket is a large plate that is formed to have a liberal depth of water above the cylinder heads and it is secured by a series of cap screws. This design insures that the jackets will be well formed and thoroughly cleared, so that there will be no obstruction and circulation of water will not be restricted. This makes for efficient cooling. The valves are at the left side of the engine.

The blocks are cast with heavy base flanges and with webs at the ends and centre beneath the valve pockets to house the valve mechanism. The blocks are tested by water pressure before being rough bored to determine leaks and defects, and are then aged to eliminate distortion due to machining strains. Next they are reamed and ground to exact dimensions, after which they are subjected to the final test under water pressure.

#### Pistons and Crank Case.

The pistons are cast from the same material as the cylinders and they are five inches length to obtain evenness of stroke and insure against wear from side

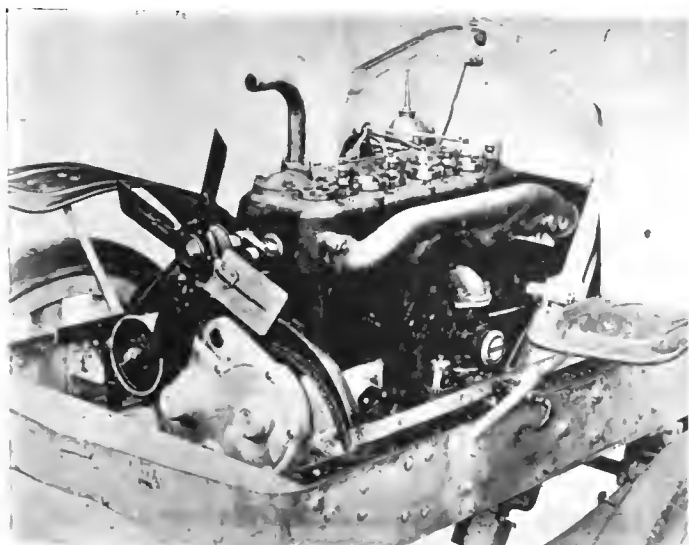
The lower half of the case may be removed for examination of or work upon the main bearings and the connecting rods without removing the engine from the chassis.

#### Crankshafts and Connecting Rods.

The crankshaft is drop forged from a special steel with the flywheel flange integral and with a flange at either side of the centre bearing that will take the end thrust and preserve the relation of the bearings, no matter what the service. The crankshaft is  $1\frac{7}{8}$  inches diameter and the bearings are  $2\frac{9}{16}$ , three and  $3\frac{13}{16}$  inches length, the total bearing surface being  $9\frac{3}{8}$  inches long. The tensile strength of the shaft when it is heat treated, is 90,000 pounds to the square inch. The shaft is carefully ground to size.

The connecting rods are I sections, drop forged from .35 carbon steel. These are bored and reamed by special machine tools to secure perfect centres and correct alignment, and they are heat treated to afford strength. Each rod big end cap is retained by four nickel steel bolts and locked nuts. The wristpins are





Front of Chassis with Radiator Removed, Showing the Valve Side of the Four-Cylinder Continental Engine.

made from tubing of special stock that are hardened and ground. The wristpins are secured in the piston bosses and the phosphor bushings of the small ends of the connecting rods oscillate on the wristpins.

#### The Camshaft and the Bearings.

The camshaft is drop forged from low carbon steel with the cams integral. The shaft is first turned and the cams rough machined, after which it is annealed and heat treated. It is then finish ground on a special machine that insures great accuracy of cam contour. The shaft is  $1\frac{1}{16}$  inches diameter and is carried on three bearings that are from front to rear  $2\frac{1}{4}$ ,  $1\frac{7}{8}$  and  $1\frac{7}{8}$  inches diameters respectively, and  $2\frac{5}{16}$ ,  $1\frac{1}{2}$  and  $1\frac{1}{4}$  inches length.

The bearings for the crankshaft, camshaft and connecting rods are made from a high-grade nickel bab-bitt metal, the crankshaft and connecting rod bearings being seated in bronze cages or shells in which they are fixed by brass retaining screws. The connecting rod bearings are adjustable with steel shims as they become worn. All the bearings are fitted with great care, and then expanded, reamed and burnished.

#### The Timing Gearset and Valves.

The timing gearset is made up of four gears, the crankshaft, the camshaft, the water pump and the idler gear. The gears have wide faces and are helical cut to afford noiseless operation. Much care is taken to obtain accurate gear centres. The gearset can be readily reached by removing the cover of the housing.

The valves are interchangeable and are made with nickel steel heads electrically welded to carbon steel stems, the ends of the stems being hardened to resist wear. These are mounted in long guides seated in the cylinder block. The valve ports are two inches diameter and the clearance is such that free exhausting and

complete charging is assured. The valve tappets are a mushroom type that are mounted in removable guides seated in the base flange of the cylinder block, and these are fitted with adjusting screws and lock nuts. The valves are actuated by oil tempered springs that are retained by a special locking device. The two cover plates for the valve chambers are retained by thumb nuts on studs that are quickly removable.

#### The Cooling and Lubricating Systems.

The engine is cooled by a circulation of water forced through the cylinder jackets by a centrifugal pump that has two extra large bearings and stuffing boxes. The radiator is fitted with a chamber into which the boiling water is passed and where the steam condenses, the cooled water returning to the radiator. The radiators are suspended at three points on large rubber cushions to protect them from chassis distortion and road shock, and they are protected by large bumpers. Radiation is promoted by a large fan that is carried in a ball bearing on an adjustable bracket on the forward end of the cylinder block, which is driven by a flat belt by a pulley mounted on the forward extension of the water pump shaft.

The lubrication system of the engine is a combination of the force feed and splash. In the oil reservoir in the engine base is a well with a screened inlet in which is located a vertical plunger pump that is driven by eccentrics mounted on the camshaft. The oil is forced by the pump through tube to the rear main bearing and to the timing gearset, flooding them freely. The oil drains to the troughs in the base of the crank chamber, from which it is distributed by splash to the cylinder and piston walls, the connecting rods, cams, centre main bearing and the valve tappets. The camshaft bearings are lubricated from pockets cast in the walls of the crank case that are filled by splash, and the wristpins are similarly served from oil trapped at the heads of the pistons.

#### Carburetion and Ignition.

The fuel is fed to the engine through an automatic float fed type of carburetor that is supplied by gravity, and there is a governor fitted to the intake manifold that is controlled by the velocity of the gas. The normal limit to which the vehicle is governed is 15 miles an hour. The ignition current is generated by an



A Standard Two-Ton Chassis Equipped with a Cab and Platform Body with Rack Sides, This Being an Equipment Very Frequently Supplied.

Eisemann high-tension magneto that is water proof and which is operated with a fixed spark. The fuel supply is regulated by a hand throttle and foot accelerator.

The clutch is a standard type cone that is of large diameter and face, that is leather faced, with engagement springs beneath the facing. The clutch engages easily and is stated to be in every way efficient. The engine and clutch unit are carried at three points—on a forward trunnion seated on the forward cross frame member, and by crank case arms seated on the frame side members.

#### **The Power Transmission System.**

There is one universal joint that couples the clutch shaft with the main shaft of the transmission gearset, which avoids any possibility of strains upon the engine from chassis distortion. The gearset is a selective sliding gear type that has three forward speed ratios and reverse. The shafts and gears are large and are made from nickel steel, the shafts being heat treated. The shafts are mounted in heavy duty roller bearings that have great endurance. The gearset case is suspended at three points in the frame from two heavy cross members.

The main shaft is coupled at the gearset and at the worm shaft of the Timken-David Brown rear axle by universal joints. The shaft is comparatively short and there is no "whipping," no matter what the work. The Timken rear axle is a full-floating type, the housing consisting of a central section to which two end sections are bolted. The centre part of the housing is enclosed by a large plate on which is assembled the worm shaft and the worm gear and the bevel gear differential gearset. The differential gearset is mounted on Timken roller bearings that are carried by the spiders or frame. The entire assembly is removed by taking out the bolts that retain the cover plate. No change of adjustment of the gearset is occasioned by the removal.

#### **The Rear Axle Construction.**

The end sections of the axle housing are reinforced by heavy steel tube that forms the sleeves for the axle spindles, and on these are mounted the Timken roller bearings on which the wheels revolve. The axle shafts extend through the sleeves to the outer ends of the wheel hubs and carry flanges that are formed into clutches that engage with the hubs. The axle shafts are forged with the flanges integral. The end sections of the housing carry the spring seats and the flanges in which the brake shafts are mounted. The forward axle is a Timken I section, drop forged from steel, that is fitted with heavy steering knuckles. The heads of the knuckle pivots and the wheel spindles are equipped with Timken roller bearings. The wheels are wood, artillery type, and are equipped with 36 by four-inch tires forward and 36 by six-inch tires at the rear.

The frame is an extra heavy rolled steel channel section six inches width, with wide webs, that has liberal cross members. It is heavily gusseted and is hot riveted. The frame is suspended on semi-elliptic, elec-

tro-chrome-silicon-manganese steel spring, the forward set being shackled at the rear ends, and the rear set being shackled at both ends. All spring eyes are bronze bushed and the spring bolts are hardened and ground and fitted with grease cups. The radius rods are a round rod type of nickel steel that are pivoted at the forward ends to very heavy hangers, that are mounted outside on the frame side members, well forward of the spring hangers. The wheels are wood, an artillery type with heavy square spokes, that are equipped with solid band tires, 36 by four inches forward and 36 by six inches rear.

#### **Steering Gear and General Detail.**

The steering gear is a heavy irreversible worm and nut type construction that is located at the left side of the chassis and is operated by an 18-inch hand wheel. The linkage with the steering knuckles is very heavy and is placed behind the front axle to protect it against contact with road obstructions. The control of the machine is by conventional clutch and service brake pedals, by a throttle lever on the wheel of the steering column, and by an emergency brake and a gear shifting lever in the centre of the footboard. The service and the emergency brakes are the same design, internal expanding within large diameter drums on the rear wheels, and being a duplex type they are extremely efficient.

The endurance of the machine was given material attention by the designer, and every practical provision was made for compensation for wear, there being liberal bushings in all lever ends, pedal bearings, spring shackles, spring eyes, and in all places where restoration might be expected from time to time. Replacement of the bushings instead of the parts is intended to result in a considerable saving during the life of the truck.

The chassis is regularly equipped with an all-steel driver's seat, a welded steel gasoline tank of 20 gallons capacity, steel fenders, oil dash and tail lamps, mechanical signal horn, jack and kit of tools in a tool box. The price for a chassis of standard dimensions is \$2000 f. o. b. at Detroit. The chassis will be equipped with bodies, either of standard types or to specifications, to meet the requirements of the owner.

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W. L. Van De Wiele, formerly direct factory representative for the Garford Motor Truck Company, has resigned that position to join the Brockway Motor Truck Company, Cortland, N. Y., as district sales manager for the New England states.

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The police department of Janesville, Wis., has been authorized by the city council to purchase a motor police patrol which is not to cost more than \$700.

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F. E. Titus, head of the Goodrich Rubber Company's branch in Pittsburg, Penn., for some years, has been made general manager of the branches in Buffalo, Rochester and Syracuse.

### TIMKEN PLANT EXPANSIONS.

At the metal products plant of the Timken-Detroit Axle Company, Detroit, Mich., the fourth new addition since March, 1915, has been started. This is an extension of the main building and will be 163 feet long by 40 feet wide and four stories high. It will be used entirely for manufacturing purposes and will cost in the neighborhood of \$175,000. The growth of the company has been one of the wonders of Detroit. Today the plants cover 16 acres of ground and contain 588,600 square feet of floor space, all of which is in active use. It is near the head of the list of great Detroit factories, both in the amount of floor space and in the value of its products.

### TAXIS MAY ESCAPE CITY REGULATION.

The Public Service Commission in New York state has assumed jurisdiction over the taxi lines that have contracts with the railroad companies—the Yellow Taxi Cab Company—and the city of New York is contesting this right to jurisdiction on the ground that if it is assumed the city will be unable to regulate the taxi service by ordinance.

### MOTOR TRUCK CLUB DINNER.

The March meeting of the Motor Truck Club of America, New York City, was a get-together beefsteak dinner at Churchills, at \$5 a plate, at which Francis M. Hugo, secretary of state, and Arthur Woods, police commissioner of New York City, were the guests of honor.

### ARMY BUYS WHITE TANK TRUCKS.

When it was decided to send trucks into Mexico, in addition to buying three trains of 27 transport trucks, each train containing also a repair truck, the government asked for bids for three 600 gallon water tank trucks to be delivered at the earliest moment.

The White company had recently sold three chassis to the Standard Oil Company which it knew had been fitted with oil tank bodies of the right capacity in the Boston shops of the Standard Oil Company, and it immediately asked that concern to turn the trucks over to the White company.

This request being granted, it then offered the government delivery of the three trucks in 24 hours. This offer was instantly accepted and the trucks shipped.

### NEW LIGHT ACME TRUCK.

#### Follows the Design of Larger Type and Is Built of Standard Parts.

The Cadillac Auto Truck Company of Cadillac, Mich., is putting on the market a  $\frac{3}{4}$ -ton Acme truck in addition to the two-ton model which has been produced for several months and is now being distributed in many cities of the country.

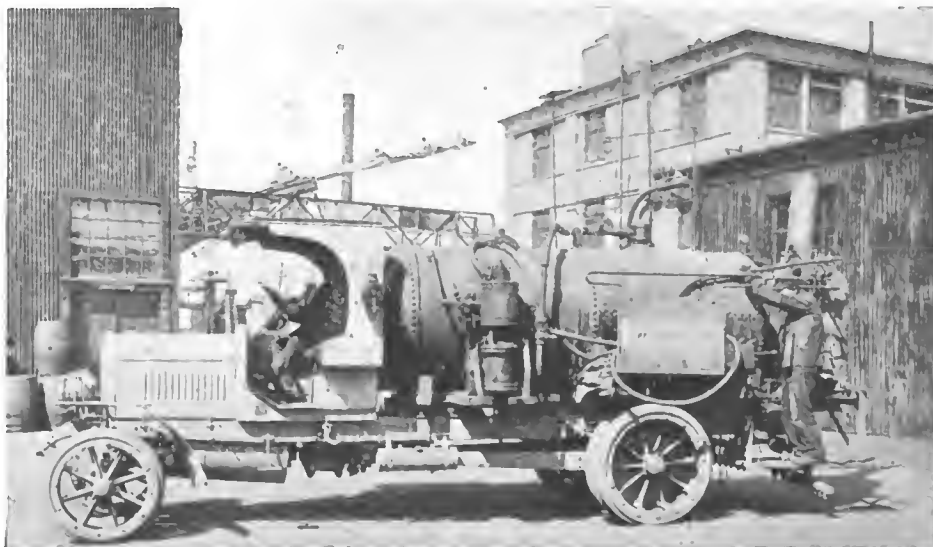
The new truck will carry a load of from  $\frac{3}{4}$  to one ton and is built, as is the larger vehicle, from the best of standard components. Both trucks have Timken-David Brown worm drive axles; both have Continental motors, Detroit self-lubricating bronze bushed springs front and rear, Warner transmission gearsets and other standard parts.

Some of the chief features of the new truck are a four-cylinder motor with cylinders having bore of  $3\frac{1}{2}$  inches and stroke of five inches, cast en bloc. The cooling system is thermo-syphon, the ignition current is supplied by an Eisemann fixed spark magneto, and the carburetor is a Rayfield.

The clutch is a Warner dry plate multiple disc type with a selective sliding gear transmission gearset mounted in unit with the motor. The wheelbase is 128 inches and there is 100 inches of loading space behind the driver's seat. The frame is of heat treated pressed steel. Internal service and emergency brakes operate within drums mounted on the rear wheels. The springs, both front and rear, are semi-elliptic. The steering gear is a Gemmer.

The price for the chassis with equipment is \$1290 f. o. b. Cadillac.

R. H. Macy & Co., New York City, has placed an order for 31  $1\frac{1}{2}$ -ton Mack trucks with the International Motor Company. This followed an order for 12 similar trucks which was placed some months ago.



G-V-Mercedes Six-Ton Truck Equipped with Tar Spraying Outfit, Owned by Chelsea, Mass., Contractor, Who Does Road Work for Materials Manufacturer of Boston.

## MACHINERY AND VEHICLE EQUIPMENT.

### INFLATING VALVE.

Those garage men who have been annoyed by the carelessness of patrons, who after inflating their tires, neglect to shut off the flow of air, should investigate the Schrader automatic inflating valve, which is shown herewith. Its use insures against waste of air before, during and after inflation.

This device can be supplied with different sizes of shanks, from  $\frac{1}{4}$  to  $\frac{3}{8}$ -inch, to fit any garage air line. When properly installed, air can only be obtained by applying the nozzle of the inflating valve against the tire valve. This opens the check in the angle valve and allows the passage of air into the tire. The instant that the pressure on the tire valve is removed, the valve in the hose automatically closes.

Manufactured by A. Schrader's Son, Inc., 800 Atlantic avenue, Brooklyn, N. Y. List price, \$1.

### ELECTRIC DRILL AND GRINDER.

The portable electric hand drill and bench grinder shown are particularly handy equipment for any garage or repair shop. The drill is made in six sizes, ranging from  $\frac{1}{4}$  to  $1\frac{1}{4}$  inches. The weight ranges from seven to 38 pounds, according to size. The bench grinder is made in four sizes, from  $\frac{1}{4}$  to three horsepower, the smallest size weighing 20 pounds.

These machines are wound for both direct and alternating current and are also equipped with Universal dirt and dust proof motors for use on either current. Cooling is by a fan mounted on the armature shaft.

High-grade ball bearings are used in both machines to reduce the friction load to the minimum. As practically any length of cable can be used with this equipment, the tools are adapted to both inside and outside use.

The maker of these tools also manufactures a complete line of tool post grinders for use in the lathe, and hand grinders and huffers for external work.

Manufactured by the Cincinnati Electrical Tool Company, Cincinnati, O. Prices and trade discounts sent upon application. Ask for the company's catalogue.

### TAPPING CHUCK.

The Woodstock reversing tapping attachment and tapping chuck shown in the accompanying illustration, is designed to be used horizontally as well as vertically. When the tap binds in the work, or reaches the bottom of a hole, the safety tapping chuck automatically releases and prevents the tap from breaking. Statement is made that by the use of this chuck 95 per cent. of the strength of the tap can be applied without causing breakage.

The reversing attachment is made in two sizes, for drill presses, lathes and screw machines. The gears are cut from



high-grade steel and operate in grease. By merely raising the spindle of the drill press, this arrangement causes the tap to turn in a reverse direction.

Manufactured by the Peter Brothers Manufacturing Company, Algonquin, Ill. Descriptive catalogue supplied on request.

### P. D. Q. GREASE GUN.

The P. D. Q. grease gun is powerful, durable and quick. The plunger lifts out with the handle, allowing the open end of the gun to be loaded by a paddle. When the handle is pulled down the plunger forces out the entire supply of grease with a single stroke. Statement is made that 18 ounces of grease can be discharged per minute, and without soiling the operator.

Manufactured by the Star Brass Works Company, Kansas City, Mo. List price, \$2.50 each.

### THE TELOMETER.

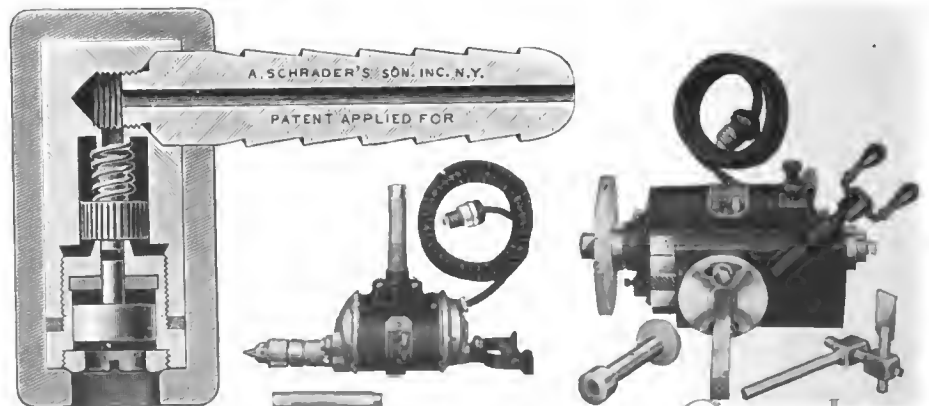
The telometer shown in the accompanying illustration is designed for testing the various cylinders of an internal combustion engine to determine the height of compression in pounds per square inch. It also enables the operator to calculate the actual horsepower developed by each. The device screws into the spark plug opening and the exact compression under running conditions is recorded on a small card, which is furnished.

By the use of this instrument the operator or the repair man can quickly locate any lost efficiency without disassembling any parts. The maker states that an unquestionable formula for calculating the actual horsepower developed in any cylinder of a four-cycle internal combustion engine and based upon an average speed of 800 revolutions per minute is as follows:

$$Tx2Ax165=H. P.$$

33,000

T represents the compression in pounds per square inch as shown by the telometer; 2 is a constant; A is the area of the piston in square inches and is found by multiplying the diameter of the piston by itself and that product by



.7854; 165 is a constant; 33,000 pounds is equivalent to one horsepower. By computing the horsepower of each cylinder separately and adding them together, the horsepower of the motor is obtained.

Manufactured by the Zighometer Manufacturing Company, 1037 North Waller avenue, Chicago, Ill.

### BEAN VALVE TOOLS.

Better results with less labor can be obtained when valve grinding if Bean refacing and reseating tools are first used to remove the carbon and the unevenness of the valves and valve seats. A glance at the valve refacing tool, shown on this page, will instantly communicate to the workman the great saving of labor which is afforded by its use. It is a reversible frame, supporting at one end a disc for grinding, and at the other end a disc with spiral cutters for tooling. The adjustable bushings provided are adapted to reduction in the size of valve stem caused by wear, thus insuring perfect alignment.

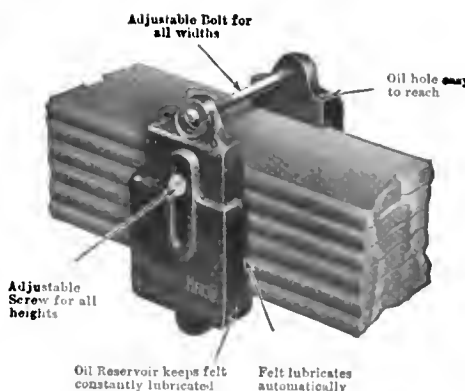
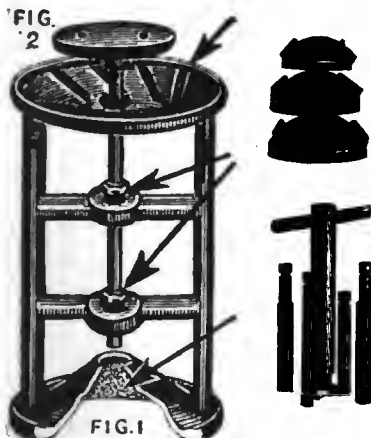
The Bean reseating tool consists of a cutter, a pilot and a cutter handle with lock nut. The cutters are made in various sizes and are of the finest steel, tempered and accurately ground. This method insures the trueness of the valve and its seat, and allows accurate grinding to be done in the shortest time possible. This equipment is of great value to any repair shop as it will increase the grade of work produced. It is also valuable to car owners.

Manufactured by the Bean Company, First avenue, Berea, O. Prices will be sent to inquirers.

### TOOL GRINDER.

The Ferro No. 2 tool grinder is designed to meet the requirements of those who desire a neat and moderate priced grinder and is especially adapted for grinding small tools, cutters, etc. This machine will run two wheels up to six inches in diameter and one inch face. It is equipped with steel spindles, with split boxes for taking up the wear and adjustable tool rests.

Its height is 6½ inches from the bench to the centre of the spindle; length of bearings, 2½ inches; diameter of spindle in bearings, ⅞ inch; diameter of spindle between flanges, ½ inch; size of



pulley on spindle, 2x2½ inches for two-inch belt, and the distance between wheels is 10½ inches.

The iron column and table shown in the illustration are especially designed for this grinder, and are more economical for such purpose than any temporary arrangement. The weight of the complete equipment is about 135 pounds.

Manufactured by the Ferrodowill Manufacturing Company, 200-214 W. Indiana avenue, St. Paul, Minn. Complete description and price sent on request.

### ADJUSTABLE OILER.

The Lazco adjustable spring lubricator shown herewith will fit all sizes of springs, from those on a Ford car to the largest truck. It is adjustable to both height and width.

Spring manufacturers state that approximately 80 per cent. of spring trouble is caused by lack of lubrication. The Lazco lubricators remedy this condition by permitting oil to be gradually and thoroughly worked in between the spring leaves. Friction is eliminated, rust prevented and the danger of spring breakage minimized.

Manufactured by the Lazarus Manufacturing Company, 746 Euclid avenue, Cleveland, O. List price, 50 cents each; a set of four for Ford cars, \$2; and a set of 10 for other makes, \$5.

### POCKET KNIFE TOOL KIT.

The So Handy pocket knife tool kit, shown in the accompanying illustration, is a practical and serviceable outfit that is useful in several ways.

This outfit includes a jack knife having a cocoa handle and an exceptionally good blade. The remainder of the set consists of a file, chisel, reamer, screw driver, bottle opener, gimlet and rule. These can be instantly attached to the knife handle. All are made of high-grade steel, carefully hardened and oil tempered. The complete outfit weighs but five ounces and may be conveniently carried in the pocket of the operator or in the car.

Manufactured by the Bridgeport Hardware Manufacturing Corporation, Bridgeport, Conn. Complete information may be obtained from the company.

### LUTHER CLAMP VISES.

A good vise is a useful tool for every person who handles tools and one of the best is the Luther clamp type shown herewith. It is declared that due to its design, it is impossible to wear or spring the jaws out of alignment. This is insured by the movable jaw being above the steel guides, which in turn are supported by the bench. The vise is made exceptionally durable by the use of steel guides, steel screws, steel jaws and handle.

Manufactured by the Luther Grinder Manufacturing Company, 285-289 South Water Street, Milwaukee, Wis.



### MAKE 400,000 FORGINGS A MONTH.

When the entire equipment of 33 drop forge hammers are installed in the modern drop forge plant of the Timken-Detroit Axle Company, the plant will have a capacity of over 400,000 drop forged parts a month, or more than 16,000 a day. This requires 10 tons of steel die blocks each month. All of the hammers have not yet been received, but they will soon be in operation.

### ROBERTSON IS NEW G-V SALES MANAGER.

C. E. Robertson, who was for four years commercial manager of the Consolidated Gas, Electric Light and Power Company, Baltimore, Md., has been appointed sales manager of the General Vehicle Company, Inc., and is now actively engaged in directing the distribution of the vehicles produced by that concern.



C. E. Robertson, Sales Manager, the General Vehicle Company.

C. W. Squires, Jr., for a considerable length of time sales manager of the company, resigned that position and at his own request was appointed to fill an important office in the service of the company. He will make his headquarters in Chicago and his activities will be in a considerable area of the Middle West.

Mr. Robertson is an expert sales director of broad experience and executive capacity, and his work has been such as specially fit him for the service in which he is now engaged. The company is expanding its sales organization and planning to increase its production of both electric and gasoline vehicles, and while its general selling policy has not been changed, it will be represented far more generally and agencies will be established in the majority of the commercial centres. The development of the selling force and the location of new agencies is now progressing.

### MYERS IS GENERAL MANAGER.

C. T. Myers has been made general manager of the Timken-David Brown Company and F. T. Zollinger, assistant general manager; C. S. Dahlquist becomes general superintendent in charge of manufacturing; Mr. Voelk is made general foreman and Mr. Taylor assistant engineer. The company has quadrupled its output during the past year.

### BETTENDORF TRUCK TRAILERS.

Two-wheeled trailers and semi-trailers are being produced by the Bettendorf Trailer Company of Bettendorf, Iowa. With the semi-trailers the Martin rocking fifth wheel is utilized as a coupling and for the trailers an automatic coupler which is very easily operated has been provided.

Model F, which sells for \$75 f. o. b., Bettendorf, has a capacity of 800 pounds, with a solid panel body six feet long and 51 inches wide. The sides and ends are 10 inches high and are topped with a six-inch flare-board. The springs are semi-elliptical and are under-slung. The axle is a truck type rectangular section, 1¼ inches square. American ball bearings of the truck type are used.

The artillery wheels are of second growth hickory, fitted with solid rubber tires, 30 by 1¼ inches, of the clincher truck type, and the body is painted red with a black stripe. Pneumatic tires are extra. When crated for shipment the trailer weighs 370 pounds. It is equipped with the automatic coupler, which can be attached in a few seconds.

Model S is also a full trailer with a capacity of 1200 pounds that is sold for \$100. It has a rectangular axle two inches by 1½ inches, truck type Bower or Timken bearings, 32 by two-inch tires, and weighs, crated, 445 pounds.

Special semi-trailers are built for use with the rocking fifth wheel in connection with Ford roadsters, trucks or other motor vehicles.

### MOTORCYCLES AFTER VILLA.

Motorcycles are the means of transportation for the aero pilots who are in pursuit of Villa in the operations of the United States troops in Mexico. A base for the aviators has been established, to which the air men drove on their machines. Here the planes are assembled and prepared for flight. The first aero squadron ordered from Fort Sam Houston is mounted on Harley-Davidson motorcycles, which are equipped with Firestone tires. The country through which the machines will be driven is about as hard for motorcycle riding as any that could be imagined. This is the first time the aeroplane has been used by the United States army in actual service.

### JITNEYS CAUSE RATE RISE.

A 20 per cent increase in rates for the San Diego and Southeastern railroad has been approved by the California Railroad Commission, because the competition of jitneys was reducing the road to bankruptcy. Before the jitneys came the road made money, but interurban trucking and passenger hauling caused a deficit of \$86,000 last year and the road was no longer able to pay operating expenses out of receipts. The increase in rates will doubtless assure the motor vehicles of future patronage.



**E**STABLISHED, so far as operating is concerned, but little more than two years ago, and today recognized as being the largest exclusive producer of motor trucks in the world, the Vim Motor Truck Company, Philadelphia, Penn., has been phenomenally successful because its vehicles in design, construction, workmanship, finish, appearance and price have been approved by business men generally, and in service these machines have proven remarkably economical and extremely enduring.

Regarded practically, and the practical aspects are those considered when the hard-headed man of affairs deliberates a proposition, the Vim truck is a transportation unit that is adaptable to nearly any service. First of all it is designed for hard work, it is substantial in construction, it is built of high-grade materials, and all of these factors are obvious to the observer. Second, it is sold at a price that is very small considering its quality, which is a result of quantity production.

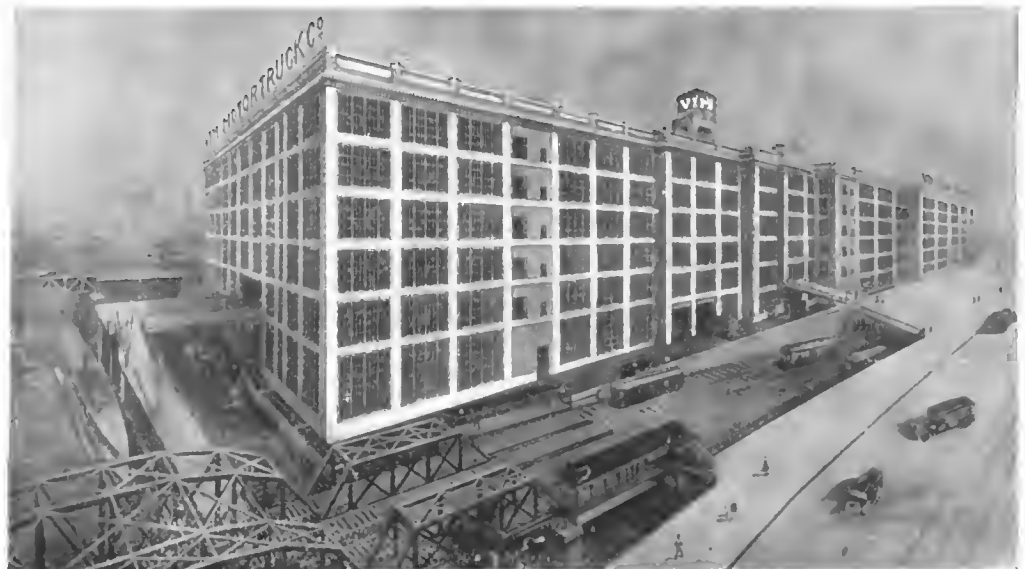
Those who produce, those who sell, those who own and those who operate motor trucks understand that business men seldom, if ever, base their determination on sentiment. Quality must be recognized and confidence established, and that the Vim Motor Truck Company has developed with such extreme rapidity, and withal so soundly, must be attributed to Vim trucks precisely meeting the requirements of an overwhelming majority of those who require motorized transportation equipment.

#### Growth Controverts Precedents.

That this remarkable growth has been made seemingly controverts all precedents, for conservatism has been the rule rather than the exception with those who use trucks for transportation. Not only this, it

has been accomplished without sensational methods, aside from the sensation that has marked the progress of this concern and its organization.

Today this company has representatives in 440 cities and four factories are producing Vim trucks, while a fifth—a million dollar plant—is now building and will be in operation early this spring. The proportions of the plant, which is equipped with the latest types of machine and hand tools and facilities, and the distributing organization, demonstrates the almost universal demand for Vim trucks—a demand that exists because the machines are what business men want.



The New Million Dollar Plant of the Vim Motor Truck Company at Market and 23rd Streets and the Schuylkill River, Philadelphia, Penn.

The capacity of the vehicle that would best serve, or at least best serve the greatest number, had never been determined. A prevailing belief was that large units were the most economical for all purposes, and the statement, born of careful analysis, that 80 per cent. of the world's bundles could be handled most economically and most efficiently by a unit of half-ton capacity, was the basis of the Vim truck, for it impelled H. B. Larzelere, now vice president and general manager of the Vim Motor Truck Company, to make investigation of the actual transportation needs of business.

The problem was no small undertaking, because on



**Plant No. 5 and Present General Offices at Broad, Huntingdon and Carllale Streets, Philadelphia, Penn.**

its solution depended success or failure, and after careful study he was ready to prove his conclusions. He did this by producing a machine that was intended to be equal to any requirement every day of the year. The truck was not designed or constructed without disheartening experience, but Mr. Larzelere is a trained mechanic and concentration and perseverance

it resulted in establishment of agencies in all parts of the nation, and the energies of the selling force were reflected at the factories by the orders. The Vim truck was known quickly and its reputation as a machine of worth and merit was established with its users. This was true of every community in which it was sold. Philadelphia, where the company and its factories are located, is today, from the viewpoint of the merchant, at least, a city of Vims, and in the other large cities they are used in large numbers.

#### **New Million Dollar Plant.**

The new million dollar plant of the company is an ideal manufacturing establishment. Located at 23rd and Market streets, it is on one of the most prominent and desirable sites for a structure of this character in the Quaker City. The Schuylkill river flows immediately before its western front and two railroad spur tracks enter its ground floor. An idea of the capacity of the spurs can be gained from the fact that 27

cars can be loaded or unloaded directly from the shipping platform without switching.

The factory is a daylight structure, and all of the power for the cranes, elevators, machine tools, etc., will be electricity. The manufacturing is to the most approved scientific methods, the construction originating on the upper floor of the building and continuing progressively from the one floor to another until the



**Vim Standard Chassis Equipped with a Model De Luxe Body, This Being a Fully Enclosed Type with Wood Frame and Steel Panels, with Unusually Complete Equipment.**

eventually produced a machine that was believed to be as practical, as simple and as economical as mechanical judgment could devise.

#### **Producing and Selling Plans.**

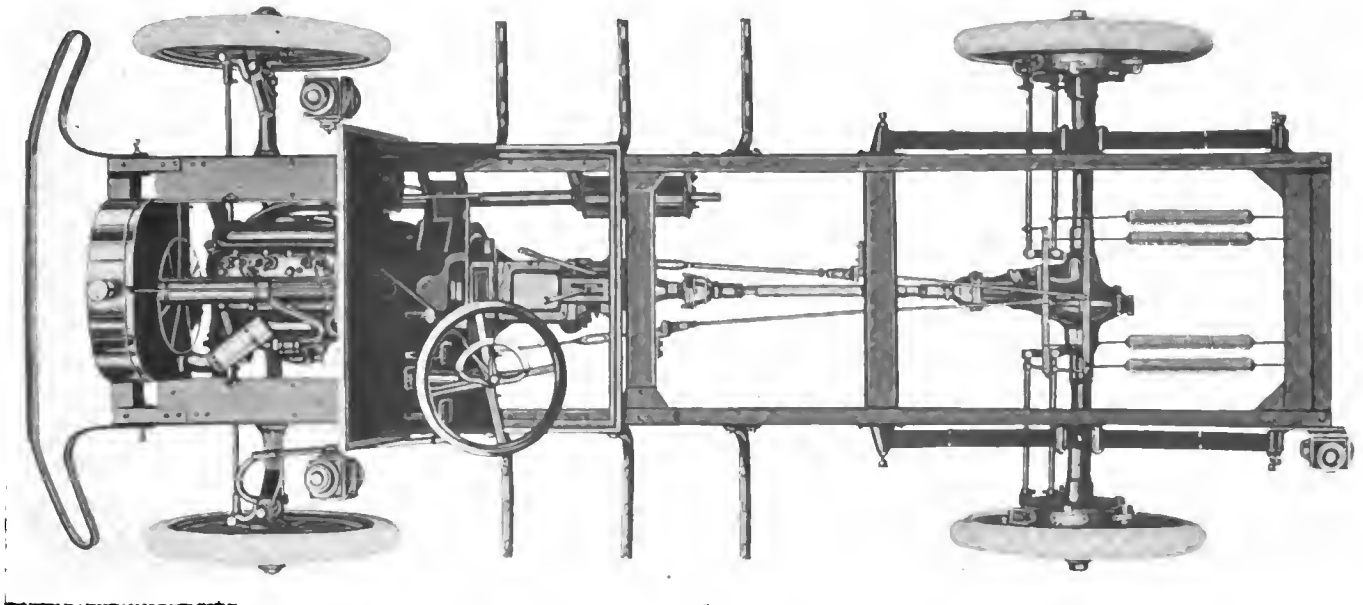
When the truck was perfected and the manufacturing problems met, plans were made for marketing it. A sales department was organized and Wayne W. Light, who had wide experience and possessed original ideas of selling plans and selling forces, was made director of sales, he having absolute jurisdiction over the distribution of machines. Mr. Light was equally as confident as Mr. Larzelere, but his proposition was educational—for he had to develop an organization and inspire his representatives with his confidence and his enthusiasm, that they in turn could convince the business men.

The campaign of introduction would, if its history were written here, be a real romance of industry, and

painting and shipping departments are reached on the ground floor. With this factory worked to its capacity the output of vehicles (including those already operating) will be 30,000 annually, or practically 100 machines daily, and this with one shift of employees working eight hours. The general offices of the company, now at Broad and Huntingdon streets, will be



**No. 4 Plant, at North Wales, Penn., Where the Vim Bodies Are Built.**



Plan View of the Stripped Vim Chassis, Showing the Unit Power Plant Suspended at Three Points and Transmission System.

moved to the new building as soon as it is ready for occupancy.

#### Success from Vehicle Practicality.

The success of the Vim company is based on the practicality of its vehicles in the service of the average business man. It is not a radical machine. To the contrary, it is extremely conventional in design, but the construction insures longevity in conditions that would be quickly destructive of trucks not specially built. There is a single chassis, which sells for \$635, and on these are installed seven different types of body, which range in price up to \$1050. The series is made up of equipment perfectly suited to the needs of most businesses, but special bodies to meet extraordinary requirements will be constructed at small additional cost to the purchaser.

#### Engine Designed for Truck Use.

Complete description of the chassis is not possible in limited space, but some of the details are given. The engine is essentially designed for truck construction, having proportions and dimensions such as are found in engines for pleasure car installation rated from 40 to 45 horsepower. The engine cylinders are cast en bloc and have bore of three inches and stroke of  $4\frac{1}{2}$  inches. With this high ratio of stroke to bore the engine is exceptionally efficient. The maker claims production of 22 horsepower. The extra length pistons are fitted with Wasson compression rings. The connecting rods are 11 inches length from centre to centre.

The crankshaft is of special alloy steel, is two inches diameter and has three main bearings  $3\frac{1}{4}$  inches length, or a total bearing length of  $9\frac{3}{4}$  inches. The camshaft is forged with the cams integral and it is ground with extreme accuracy. It is mounted on three bearings. The valves are tungsten steel and operate in long guides. The gears of the timing gearset are hel-

ical cut. By the removal of the pressed steel crank case lower section the main and connecting rod bearings may be examined or worked upon.

#### Lubricating and Cooling Systems.

The engine is lubricated by a combination force feed and splash system, the oil being circulated over the main bearings and timing gearset by a pump and distributed by splash throughout the interior. The lubricant circulates through a sight feed gauge on the dash.

The engine is cooled by a thermo-syphon circulation of water through the engine jackets and a large radiator, the unusual capacity of the system insuring positive cooling in all operating conditions. The cooling system is ample for a 35 horsepower engine. The ignition current is supplied from a Splitdorf-Dixie high-tension magneto, and the fuel is fed through a special fool proof carburetor designed for this engine, that is equipped with a dirt trap.

#### The Power Transmission System.

The clutch is a cone  $13\frac{1}{2}$  inches diameter and is  $2\frac{1}{2}$  inches width that is faced with leather. This is operated by a multiplying lever mounted on ball bearings to insure smooth and easy engagement. The thrust is taken on a large ball bearing. The clutch is



Plants No. 2 and 3 at 20th and Woodstock Streets and Montgomery Avenue, Philadelphia.

sufficient in size to serve for a 35 horsepower engine. The transmission gearset is a selective type sliding gear construction, affording three forward speed ratios and reverse. It has a short and heavily built case and the shafts and gears are chrome nickel steel. The shafts are mounted on very large annular ball bearings. The gearset is quiet in the gear reductions and the housing is oil tight.

The rear axle is a three-quarter floating construction, especially designed for truck use. The differential driving and compensating gears are chrome nickel steel. The driving shafts are nickel alloy steel  $1\frac{3}{4}$  inches diameter. The wheels are mounted on Hyatt flexible roller bearings. The front axle is a drop forged I section  $2\frac{1}{2}$  inches depth, and it is fitted with bronze bushed steering knuckles. The axle and steering knuckles are heat treated. The wheels are fitted with special alloy steel races.

#### **Brakes Have Large Capacity.**

The service brake is external contracting and the emergency brake internal expanding, operating on brake drums 12 inches diameter and  $2\frac{1}{4}$  inches width on the rear wheels. The drive is the Hotchkiss type, through the forward ends of the rear springs, and the power is transmitted through a main shaft having two universal joints between the transmission gearset and

line tank will contain nine gallons. The machine is driven from the left side, it has the usual foot pedals for clutch and service brake operation and a foot accelerator, and gear shifting and emergency brake levers are located in the centre of footboard.



**The Vim Seal.**

Two of the most popular types of standard bodies are the De Luxe (full enclosed) and the flareboard express, both of which are illustrated.

#### **The Flareboard Express Body.**

The flareboard express body is built with heavy wood flooring, with metal skids lengthwise, supported by three horizontal bolsters resting on the chassis frame. Highest grade heavy gauge furniture steel side panels are screwed to the ash side posts. These will take an extra smooth paint finish. The strength and durability is equal to equipment of much greater capacity, and the body will endure extreme usage. The roof is a solid tongue and groove construction. The top is fitted with full roll curtains for the sides, rear and front, with snap hooks for all curtain fasteners. A folding windshield completely encloses the driver.

The tail gate is built very heavy to support a full load when lowered. It is supported by leather covered chains. There is a cushioned seat the full width of the body with a lazy



**Vim Chassis Equipped with Model F Body, This Being a Flareboard Express Type with Standing Top Enclosed with Curtains.**

the rear axle. The steering gear is a Jackson-Church-Wilcox patented type, a split nut and lever construction that is adjustable for wear. The gear is firmly anchored to the frame. It is irreversible and will give the full turn in either direction with a  $\frac{5}{8}$  turn of the hand wheel. The ignition and throttle levers above the steering wheel are retained by friction. The wheels are wood, artillery type, and are equipped with 31 by four-inch pneumatic tires.

The weight of the chassis is about 1600 pounds and the speed is from two to 30 miles an hour. The gaso-

back. The inside dimensions are  $43\frac{1}{4}$  inches width at the floor, 54 inches wide at the tops of the flared sides, 70 inches length, 83 inches length to the end of the lowered tail gate and  $54\frac{1}{4}$  inches height. This is the model F body, and the equipment consists of a mechanical signal horn, tools, tire pump, oil dash and tail lamps, windshield and extra demountable rim with tire bracket. The finish is standard dark blue with red wheels. The price is \$695 f. o. b. Philadelphia.

The De Luxe body is designed for department stores and merchants requiring roomy enclosed equip-



ment and is handsome in appearance and extremely well finished. The work is high-grade throughout, the body equalling touring car construction in its appointments and fittings, with the strength and durability essential for freight work. The frame of the body is wood reinforced with steel. All panels are heavy furniture steel. The rear doors and tail gate are of unusual strength. The doors have oval bevel plate glass lights, and similar lights are at either side of the driver's seat. The loading dimensions are: Length from rear of driver's seat to rear doors 69 inches, 43¼ inches width and 58 inches height. The driver's seat and the double lazy back are upholstered. The roof and floor of the top are constructed the same as those of the flareboard body. The gasoline tank, beneath the driver's seat, will hold 10 gallons. The equipment includes full side roll curtains and folding glass windshield that completely protect the driver, mechanical signal hand horn, oil dash and tail lamps, tire bracket on running board with extra demountable rim, tire pump, jack, tools, etc. The price, finished in standard dark blue and with red wheels, is \$725 f. o. b. Philadelphia.

#### **Other Type Bodies for Special Work.**

These two bodies can be readily adapted to such services as would ordinarily be required for the delivery of the average business man. Additional bodies that are standard on Vim chassis are passenger or hotel or station 'bus, a salesman's car with a large compartment for carrying samples, a taxicab and an undertaker's wagon.

The utility of Vim trucks will, as has been demonstrated conclusively, afford the merchant better and more economical service, insures satisfied customers and is an advertising adjunct of compelling power that will vastly increase the trade horizon. This has been the result wherever they have been used in greatly diversified businesses and in city streets and on country roads all over the United States. With many department stores the Vim truck is standard equipment.

#### **Actual Trial Proved Service Value.**

The Bell Telephone Company, which has developed largely through obtaining efficient service at minimum expense, has tried delivery equipment of practically every description. A Vim delivery wagon owned by this company was tested during a winter, this being the worst season of the year so far as operating difficulties are concerned. Accurate records were kept and after a satisfying period the machine was disassembled and examined to determine the wear. As a result of this trial Vim trucks were adopted as standard equipment for every branch of the company's service throughout the country.

The United States government is one of the largest users of delivery equipment in the nation, requiring transportation units in parcel post delivery, mail collection, Indian reservation service, signal service, army service and in different divisions of the Department of the Interior, it has installed Vim trucks, the

selection being made purely upon the merits of the machines and without regard to cost. The government plays no favorites. Its departments have hundreds of advisors, dozens of judges, and specifications are carefully prepared by engineers who from experience and knowledge of requirements are qualified to judge. With all its purchases a bond that insures quality and service is required. Where competitive bids are required, and this is the usual method of purchasing, the government generally buys at the lowest price bid, but this privilege was waived when Vim trucks were bought and service merit alone was the determining factor.

#### **HAVOLINE WINS UNIVERSITY TEST.**

Unknown to the refiners the mechanical engineering department of Purdue university recently undertook a comparative test of all the well known makes of lubricating oils in its laboratories. The test included all the qualities of a good oil and when it was completed Havoline oil, made by the Indian Refining Company, was certified to be the best oil with respect to wearing quality, to heat resisting quality, to minimizing frictional loss and to uniformity of action at all temperatures. The purpose of the test was purely scientific and without relation to the marketing of oil.

#### **WILL BUILD LIGHT TRUCKS.**

The Day-Elder Motors Company has been organized with Charles P. Day as president, George A. Gemmer, Harry H. Hay and Alfred W. Gieske vice presidents, Fred C. Elder treasurer and Theo. McC. Marsh secretary, and a factory has been established at 161-67 Ogden street, Newark, N. J., to engage in the manufacture of light motor trucks. The company will at first produce two machines, of 1000 and 2000 pounds capacity.

#### **SHUART WITH INDIANA TRUCK COMPANY.**

The Indiana Truck Company of Marion, Ind., announces that R. G. Shuart has been engaged by it as production engineer. For several years he had been in the truck department of the Packard Motor Car Company in various executive positions. For two years before that he had been in charge of the transportation department of Marshall Field & Co., Chicago.

#### **FARMERS USE 4000 TRUCKS.**

It is authoritatively estimated that 4000 trucks are now in use on farms. This is about four per cent. of the number of trucks in use in all services in the United States. These vehicles have all been bought during the past two or three years, which indicates that the absorptive power of this market is greatly increasing.

## RIKER TRUCKS MAKE GOOD.

### Not One Has Failed in the Hard Service During the European War.

Remarkable service, which has occasioned much comment among European army engineers, has been obtained with the Riker trucks, made by the Locomobile Company of America, that are in use in the armies of some of the nations engaged in the European war.

Whether because of the difference in gasoline or atmospheric conditions, the trucks have shown unexpectedly high capacity for speed, in many instances having a maximum of 22 miles an hour. With nearly every truck it was necessary to adjust the engine governors to a much lower rate of speed so that the machines wouldn't run away from other trucks on the road.

The trucks have been used satisfactorily in work that was created only by war conditions. None of them has failed mechanically from service or been withdrawn, according to reports which have reached the Locomobile company's officials in Bridgeport.

Because of the unusual speed the trucks have been much used for the transportation of troops, often from the railroads to the fronts, usually distances of several miles.

The trucks are worked in convoys of from 10 to 75 and are kept about five yards apart on the road. Once in a while a green driver will run his truck into the one ahead, smashing the radiator and doing other damage. Each truck will accommodate 30 men and more can be crowded on the side and rear steps. The British companies usually contain 200 men, which is about twice as many as there are in a company of United States troops.

Riker trucks are represented in every branch of the French service, in hospital work, and in carrying munitions, supply transport and passenger hauling.

### WANT CAMPBELL IN PARIS.

Chester I. Campbell, who for years has managed the Boston Automobile Show, as well as numerous other expositions held in the Mechanics' building, Boston, and elsewhere, has been offered the position of

American director of the Reconstruction Exposition which is to be held in Paris during May, June and July. France is actively planning for its industrial and commercial rehabilitation after the war. At the exposition exhibits are desired from a large number of makers of American products of one type or another that may be useful in the reconstruction of the country. Mr. Campbell is desired to secure these exhibits and take charge of them. He is now engaged with the preliminary work of the National Textile Show in Boston and cannot as yet decide whether or not he will accept the offer. The honor, however, of the proffered appointment, is much appreciated.

### PACKARD TRUCK IN SECTION.

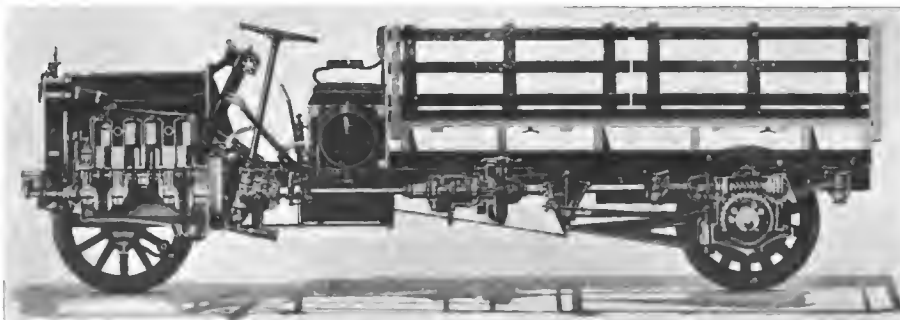
For the purpose of demonstrating to inquirers and those who are interested in the mechanical construction of the trucks it builds, the Packard Motor Car Company has resorted to a manner of illustration that is serving a very useful purpose and by which salesmen and others can demonstrate to customers the proportions and uses of the principal mechanical parts of a machine.

This is a photograph of a sectional drawing which is in effect a representation of a truck cut through the centre line, so that the relation of each important assembly is shown clearly. Beginning with the engine, this extends back through the clutch, transmission gearset, shaft, worm shaft, worm wheel and axle. With this photograph the salesmen can explain the design, proportions, construction and workmanship so that it may be thoroughly understood, for the parts are all to scale and are shown as they are when assembled and ready for use, which is even better than if the machine was disassembled.

These photographs are supplied to all the selling representatives of the company and can be shown as desired. They can be studied and with no mechanical knowledge the prospective buyer can be thoroughly informed of whatever facts he may care to learn.

### JOY DENOUNCES NEWSPAPER.

Henry B. Joy has distributed among all the employees of the Packard organization and to publications generally a letter written by him to the editor of the Detroit Journal which had intimated in an editorial that he was against a literacy test or any other restriction of immigration because he wished to take advantage of cheap labor from Europe, and discrediting sarcastically his opinion in favor of universal military training. Mr. Joy denies that he is against "free immigration," but indicates that he may not favor the literacy test.



Sectional Sketch Prepared for Packard Truck Salesmen to Illustrate the Construction of These Machines to Inquirers.

## MANY ELECTRIC TRUCKS IN EXPRESS SERVICE

**Largest Corporations Operating Them in Some of the Principal Cities with Much Economy and Find Their Efficiency an Asset of Extreme Value.**

**D**EVELOPED from, in America at least, the activities of a single man who journeyed constantly between Providence, R. I., and New York City, by train, undertaking the delivery of valuable packages and making purchases in the metropolis and delivering them to customers, what is now known as the express industry, or the special transportation of commodities of all kinds in limited volume, has attained remarkable proportions.

Whether similar services in Europe and other parts of the world were established with the Providence-New York enterprise as an example, or were founded by others who also realized from experience the possibilities of specially serving others, is unknown, but in this country, with its great distances, many commercial centres and an overwhelming desire to economize time and labor, the "great idea" was quickly grasped by others, and after local requirements had been met, competition developed.

The first express business was inaugurated something more than 70 years ago, and while the development of this industry would be a remarkably interesting story, it is of necessity summarized in the brief statement that eventually a very large part of this was controlled by a few corporations operated by interests that were practically identical with those controlling large railroad systems. These companies were not competitive in the generally accepted sense of competition, and rates were charged that ultimately led to agitation for and the enactment of federal law authorizing the establishment of the parcel post division of the Postoffice Department.

### **Criticism of Rates, Not Service.**

There was, as a rule, very little criticism of the express companies' services, collection and delivery being made without material delays, even in periods when all forms of transportation were congested. But when actual competition with the parcel post was begun and the majority of the public had the choice between express and mail, a very general inclination was to favor the latter because of the supposition that this was practical punishment of corporations that had assumedly levied heavily upon the people during the time they were without competitors.

This attitude of the people and the reduction of rates undoubtedly reduced the revenue of the companies to low ebb, but this was met by them with campaigns of publicity to promote their services, and after the situation had adjusted itself so the requirements could be determined, endeavor was made to stimulate business by careful attention to collection and delivery. The organizations were better systematized and

perfected so that in the large cities there was continuous and dependable collecting, in some instances so that there are "pick-up" wagons in sight nearly all the time during business hours, while in every locality nothing was neglected that would attract patronage.

### **Companies Bought Trucks Liberally.**

In their betterment of the service the companies bought motor trucks liberally and this policy has been continued, although large investments were made when the future was in every way uncertain, and the existence of the corporations depended upon their giving the people better service for rates that would impel patronage against such a well organized and capably administered national utility as the postal department. Later on the companies found increase of rates necessary, and their appeal to the public was substan-



**This 1000-Pound General Vehicle Machine Was Bought by the Adams Express Company in 1903 for a Money Wagon and Is Still in Service.**

tially indorsed, because they had made the most of a critical situation and had met it with a spirit that was fair, reasonable and deserving of common approval.

These express companies are those that afford service in large sections of the country—some of them distributing practically throughout the entire nation, although as a rule no one of these is directly represented in every state and every community other than by agencies. Excluding the small operators, which range in scope from serving from one to several communities, the large express corporations and their subsidiaries now operate considerably in excess of 2000 motor trucks, and this total is growing very fast, for the character of the service demands the most expeditious



**A Heavy Duty General Vehicle Truck, Used by the American Express Company, Near the 50th Street Terminal in New York City.**

collection and delivery. In fact, they must compete with thousands of automobiles used by parcel post and rural delivery carriers.

#### **Motor Equipment a Great Resource.**

One of the greatest resources that the express companies have had during the past year, or since the beginning of the freight congestion of the railroads, is the motor equipment that has made possible maintenance of their collection and delivery schedule despite the great demands made upon them. The delays and embargoes upon railroad freight has impelled shipments by express despite the greater charges, and the companies have accepted these and made surprisingly expeditious deliveries. In fact, conditions would be infinitely worse for all business men were it not for the elasticity of the facilities of the express companies, and though these have been heavily taxed the services have not been materially retarded.

What was probably the first use of automobile trucks and wagons in express service was made by the Boston Auto Express Company, which in 1901 undertook the delivery of the packages of several Boston department stores, as well as the handling of suburban business, this concern having 16 light gasoline machines and eight electric wagons. The first electric bought was the No. 56 General Vehicle one-ton truck that was delivered in the autumn of 1901, and the others were purchased subsequently. The company was not entirely successful, because of the failure of the health of its executive and discontinued business. Six of the electric wagons were destroyed in the fire that burned the Old Colony station in Boston, and the other two were sent to St. Louis, Mo., where they were used during the Exposition.

The experiences of the express companies with automobiles have continued over a long period, for conversion of equipment could not be made without accurate knowledge of operating cost, and this could only be determined by service. Not only this, the first machines were not by any means as dependable or enduring as those now built, and the companies, realizing the possibilities with the improvement and perfecting of the vehicles, adopted a policy of long trials in differing classes of work rather than basing decision on results obtained in comparatively brief periods of time and on general work in a limited number of localities. These trials might appear lengthy to truck manufacturers.

The first electric vehicle was bought by the Adams Express Company in 1903, and this was General Vehicle chassis No. 303, on which was mounted an enclosed body. This machine was 1000 pounds capacity and was used for the collection of money. Incidentally, this wagon is still in use and is giving such service that is regarded as economical when compared with others of much later type. In June of the same year the company purchased 12 one-ton wagons, which were used in Buffalo and Rochester, N. Y. Later on in the same year seven were sent to Indianapolis, this making a total of 20 on trial in four cities.

#### **Has 190 General Vehicle Trucks.**

To follow the results obtained by this company with General Vehicle wagons would require very much more space than can be given. There are 190 wagons of this make in the service of the company, and considerably more than 100 of other makes, of



**The 1000-Pound General Vehicle Wagon Used for Collection of Money by the American Express Company in Boston.**



A Typical 3½-Ton General Vehicle Truck with the Equipment Adopted for the Service of the American Express Company at Boston.

which 67 are in Philadelphia, and there are smaller fleets in Indianapolis, Buffalo, Rochester, Brooklyn, Newark, N. J., and New York City. The company has bought conservatively, taking 20 General Vehicle machines in 1903, 49 in 1906, 16 in 1907, one in 1910, 42 in 1912, 42 in 1915 and 20 thus far this year. One will observe that of the General Vehicle wagons practically a half were bought prior to 1912, and the remainder since that time, and that the experience with electrics has extended over nearly 13 years.

The trials of electric machines by the American Express Company have not been as long as those of the Adams company, for not until 1907 did it purchase its first General Vehicle wagon, chassis No. 1170, of three-ton capacity, and in 1908 it acquired a one-ton and a two-ton chassis of the same make. These three sizes were worked consistently until 1911, when the company took delivery of 25 two-ton and two five-ton machines. In 1912 the company bought 45 additional trucks of this make and in 1913 it added 35 more.

With the establishment of the parcel post service the company, like all the others, marked time so far as improvement of its equipment was concerned until it had a definite knowledge of the probabilities for the future. In 1915 it took delivery of six more General Vehicle trucks, and thus far this year it has purchased 45, this making the total 159. But this company also operates other makes of electric machines, there being upwards of 100 of these in service. The electric trucks are worked in New York, Boston, Chicago, Baltimore, Schenectady and other cities.

These two concerns alone have nearly 400 electric vehicles in service, and while this is a comparatively small part of the

total equipment in actual horses and wagons used, these are probably the equivalent of nearly 1000 wagons because of their constant usefulness and tirelessness.

#### Some Other Large Operators.

The Wells, Fargo Express Company bought its first General Vehicle electric in 1912, but it has since that time purchased a considerable number that are in service in Chicago, Brooklyn and several New Jersey cities. This company is more in the experimental stage than are the others, because it has not owned electric machines as long. The Canadian Express Company, which is a large operator in Canada, uses General Vehicle trucks in Montreal

and Toronto, and similar machines are used by several concerns known as "forwarders" located in London, England.

Besides these General Vehicle trucks are operated by the Atlantic Express and the Westcott Express companies of New York City, the Beardsmore Transfer Company of Spokane, Wash.; Chase Express Company, Brookline, Mass.; Gaffney's Express, Hartford, Conn.; New York Transfer Company, New York City; Northern Express Company, St. Paul, Minn.; Pacific Transfer Company, Spokane, Wash.; the National Express Company, in four cities; the Union Transfer Company, in three cities, and they are used in South Africa and in Australia by several railroads that specialize handling freight and express as do the express companies in America.

#### Economy in Concentration.

But with reference to the United States, and especially to the large commercial centres, the concerns handling express have sought to economize in many ways. The American Express Company, which had at one time 21 stables in New York City alone, has



Three and One-Half-Ton General Vehicle Used for Advertising American Express Company's Service—This Chassis Was Taken from the New York Steamer and Driven Immediately in a Motor Truck Parade in Boston.





A Section of the Terminal of the Adams Express Company at Brooklyn, N. Y., Where the Wagons Are Charged (Boosted) While the Loading Is Being Done.

quadruple as compared with normal. Delays are obviated and business interests are materially conserved.

#### Scientific Methods Applied.

The science of transportation is being carefully studied so that haulage cost will be reduced to the maximum and distribution and collection will be made more economical both of time and labor. Collection stations, zone systems of collecting and delivering, scheduled service with reference to time and greater scope of operations are being developed to better serve the

already much reduced that number, and those now in use are to be disposed of and the trucks operated from and maintained in five centrally located garages that are to be equipped with special reference to the requirements of the company and its business.

This policy is typical of the Adams Express Company, and there is reason to believe that this will be followed by the others as the equipment is motorized. For instance, fewer horses are purchased for the large cities, and as motor trucks are acquired the wagons displaced are located in other cities, where they will serve until the time for similar conversion. Gradually the greater economies of power wagons and trucks are crowding the animal vehicles from the work where the greatest benefits are to obtain through the use of machines, and where their constant utility can be realized upon. The elasticity of motorized equipment wonderfully increases the services of the companies, and the standard of efficiency can be maintained even during periods when demands are double, triple and

public. And in the receiving and delivery rooms methods of handling, of recording and accounting, are being perfected.

With knowledge born of experience the motor equipment is extremely well maintained. Extreme care is taken to keep the machines in highly efficient condition, adjusted and thoroughly repaired, and they are systematically inspected and overhauled. That the greatest mileage may be obtained and time shall not be sacrificed, the Adams Express Company, to illustrate, at its Brooklyn, N. Y., terminal, has equipment so that the electric machines can be "boosted" while they are loading, and this to supplement the regular charging. The loading platforms are spacious, so that the men have sufficient room in which to do their work, no matter how great the demand, and the shipments are systematically handled so that the work is minimized and loading and receiving can be done quickly, at least so far as the companies can control them.



A Portion of the Loading Platform at the Terminal of the Adams Express Company at Brooklyn, N. Y., the Packages for Each Delivery Route Being Separately Placed to Economize the Time of the Drivers.

**BUSINESS PROSPERITY FIGURES.**

M. H. Needham, advertising manager of the Thomas B. Jeffery Company, after a visit to the Boston show, declares that despite the bad weather Jeffery sales at the exhibition were four times what they were a year ago. Dividends from stocks owned in Boston had been \$10,000,000 greater this year than they were last, he says. The potato crop in Maine was worth \$7,000,000 more than last year. The pay rolls within 50 miles of Philadelphia had increased from \$18,000,000 a year ago to \$45,000,000 this year. People who never before considered the purchase of an automobile are planning to buy one this spring he maintained in a general summary of indications of business prosperity.

**GRAMM-BERNSTEIN'S BIG ORDER.**

Through its English distributor, Henry Garner, the Gramm-Bernstein Company of Lima, O., has just closed an order aggregating \$1,225,000 in value for motor trucks. The machines are to be used for general purposes in Great Britain. Gasoline is selling for from 55 to 60 cents a gallon in England at present.

**WHITE MOTOR TRUCK COMPANY FIRST.**

The White Company, Cleveland, O., calls attention to the fact that the company of 27 trucks organized at the White factory was the first to enter the service of the government in preparation for the Mexican expedition and it is known as "Motor Truck Company No. 1."

**KNOX DEVELOPING AERO MOTOR.**

An aeroplane motor now being developed at the plant of the Knox Motors Company, Springfield, Mass., was recently given severe experimental tests under the eyes of a United States army officer. General Manager Sutton admitted that negotiations for the sale of these motors to the United States aviation corps had been pending for some time and that it was possible that an order might be placed. The motor is built chiefly of aluminum and will develop 300 horsepower. It was designed by Frank H. Trego, the Knox chief engineer and assistant general manager, and the Knox engineering staff. No orders have yet been placed, but when the nation's preparedness programme is adopted and the aviation plan is worked out in detail the company hopes to get some.

**WANT HUDSON TRUCK TUNNEL.****Ferry Service Inadequate to Handle the Freight Traffic Across the River.**

The New Jersey cities and towns in the New York City or metropolitan district, are actively agitating for a tunnel under the Hudson river for trucks, as a result of the inadequacy of the river ferry services to take care of the heavy demands made upon them because of the great revival of business.

Petitions urging the construction of the tunnel have been circulated in Essex county, New Jersey, and will be presented to the Board of Freeholders at its meeting March 23. The situation is the same in Hudson county.

Not only has the traffic already reached a point where the ferries are unable to handle it, but it is increasing steadily and the conviction is growing that either a tunnel or bridges will be absolutely necessary in 10 years.

One of the documents being used in the campaign is a letter from the International Oxygen Company, saying that its chauffeurs had complained that at the Pennsylvania ferries in Jersey City on March 3 the line of trucks was so long it reached several blocks, almost to the City hall, and all were waiting for ferry transportation to Manhattan.

At the Erie ferries the line-up was not so great, but ferriage of trucks was refused because the boats were behind time and as the tide was very high much labor and unusual periods of time were required to load the trucks.

It is estimated that it would cost \$11,000,000 to build a tunnel 80 feet wide under the river, allowing for three lines of traffic. During the first year the figured investment would return a 25 per cent. dividend if trucks were charged 25 cents each way for the use of the tunnel.



Load of 1115 Tires, Weighing Eight Tons, Delivered to a Detroit Automobile Company on a Trailer Hauled by a Knox Tractor and Trailer—A Normal Load for a Five-Ton Truck is 500 Tires.

## H & N DUPLEX CARBURETOR.

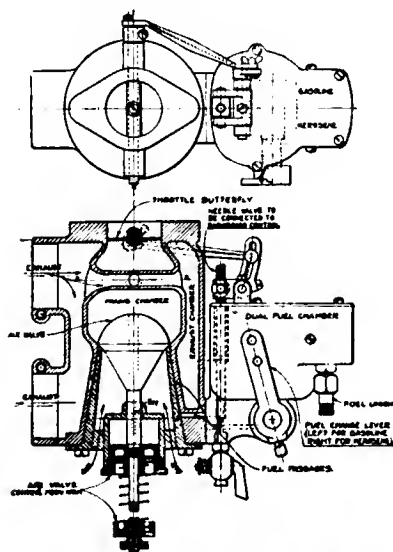
### Splitdorf Electrical Company Building New Factory—Activities and Progression of the Industry's Leading Concerns.

The H & N duplex carburetor, manufactured by the H & N Duplex Carburetor, 1790 Broadway, New York City, is an equipment which will, claim is made, volatilize both gasoline and kerosene equally well, and obtain from the latter fuel efficiency that is maintained had not been possible until this invention was perfected. The contention is that kerosene, having the same constituents as gasoline and more heat units (which means more power if utilized), is the logical fuel for internal combustion engines. Endeavor to use kerosene in engines designed for consumption of gasoline has not been generally successful, although the experiments have covered a very wide range, but there are some very good kerosene engines now built.

When used in the gasoline motor ignition, due to high compression, carbon deposits from incomplete combustion and smoke and odor have been objection-

able, and this metering must be done automatically by air coming into the carburetor to insure a perfectly combustible mixture for all speeds and loads. This being accomplished, the application of heat produced by the exhaust to the measured fuel, at a point where there was no possibility for condensation, insured complete vaporization and full inhaling by the cylinders.

The H & N duplex carburetor is claimed to be a very simple, compact and efficient instrument, that can be installed on any engine in an hour without alterations. With this the start is made on gasoline and the engine operated for a minute or two to heat the kerosene to a point of vaporization. Then with a lever on the steering wheel the gasoline is shut off and the kerosene turned on. Aside from this change the operation of the carburetor is entirely automatic. For marine or stationary work, or if there be fear of gasoline, the outer wall of the carburetor can be heated with an ordinary alcohol or kerosene blow torch to the necessary temperature for vaporizing. This is an important quality where gasoline is not easily obtainable. The instrument is sold with a positive guarantee of satisfaction. The accompanying sketch illustrates the carburetor and its principal components.



Sketch of Section of the H & N Duplex Carburetor.

able results. Statement is made that eight years' time and more than \$300,000 have been spent in the production of the H & N carburetor, which will carburetor kerosene so completely that any gasoline engine will be as efficient with this fuel, no matter whether used for automobile, marine or stationary power service, as when operated with gasoline.

The use of kerosene in gas producer plants was a basis of research. Heat was necessary to volatilize the oil (which could not be utilized save with extensive and costly apparatus), precluding its adaptation for other than stationary work and large boats. Varying experiments were made, which were generally unsuccessful because of the liability of condensation and the impossibility of metering the fuel to the load of the engine.

A well established finding was that the fuel must be metered cold, to the exact requirements of the load on the en-

#### NEW TRACTOR COMPANY.

The Wolverine Detroit Tractor Company has been organized at Detroit, Mich., with W. G. Wagenhals, formerly vice president of the Wagenhals Motor Car Company, as president and engineer. W. J. McNamara, former mayor of Edmonton, Alberta, who owns 20,000 acres of land in that vicinity, is said to be interested in the enterprise.

#### BROSSEAU JOINS FEDERAL.

A. J. Brosseau, president of the National Association of Implement Dealers, has become a vice president and director of the Federal Motor Truck Company, Detroit, Mich. Brosseau was formerly connected with the Gale Manufacturing Company of Albion, Mich.

The Rome-Turney Radiator Company, manufacturer of radiators for passenger cars, trucks, tractors and aeroplanes at Rome, N. Y., was admitted to membership in the Motor and Accessory Manufacturers at a meeting of the executive committee held in New York City, March 10.

Directors of Continental Motor Manufacturing Company at a meeting at Detroit, Mich., increased the capital stock of the company from \$2,900,000 to \$5,900,000. A stock dividend of 100 per cent. was declared.

#### NEW SPLITDORF FACTORY.

The Splitdorf Electrical Company is erecting at its Newark, N. J., plant a new fireproof building of reinforced concrete that will have a frontage of 300 feet and a depth of 60 feet, with an ell 60 by 25 feet. The structure will have 115,000 square feet of floor space and it will be lighted by 180 windows on each side and 18 windows at each end, each 17 feet by nine feet four inches, or approximately 30,000 square feet of glass. This will be one of the best lighted manufacturing buildings in America. The exterior will be ornamented by colored tile and embossing. The welfare of the employees will be given much attention. In the ell on each floor will be wash rooms, toilet facilities and locker rooms. The structure will be equipped with a sprinkler system.

Statement is made that this will be the first of several extensive improvements, but the existing buildings will not be changed. The new structure will be ready for occupancy about July 1. The company long since outgrew its building and the expansion is necessary to meet the demands for increased production. The product is exclusively magnetos and electrical starting and lighting systems. The company is now producing about 35,000 electrical automobile equipments a month. During the past year the output has more than doubled and the working force has increased to 2400. In addition about 400 are employed at the factory at Sumter, S. C., and 300 in the branches in the United States.

#### AHLBERG'S SOUTHERN BRANCH.

A branch of the Ahlberg Bearing Company has been opened at 323 Peachtree street, Atlanta, Ga., with H. A. Fisher in charge. During the past nine years the company has been rapidly enlarging its distributing system and it now has branches in New York, Boston, Detroit, Cleveland, Minneapolis, Los Angeles, St. Louis and Atlanta.

The service rendered by the company at these branches is unusual, in that a customer can receive immediately in return for a worn bearing one that has been reground and rebuilt for a price equal to about one-fifth of that of a new bearing.

The company's factories are located in Chicago and Los Angeles and there the regrinding and manufacturing of special bearings is carried out. Ample stock rooms at each branch contain a supply of new, single row annular, thrust, new double row and Radax bearings.

#### NEW CHASE REPRESENTATIVE.

Dodge & Seymour has succeeded the Markt & Hammacher Company as Chase representatives for Asiatic and Australasian territories. The new company consists of H. T. Dodge, Henry T. Seymour and Villers A. Dodge who are pioneers in the territory. The war had made it impossible for a German firm to handle the business successfully in English territory.

## RECORDS MAKE CONTRACT HAULAGE SUCCESS.

**Boston Firm, Starting with One Used Truck and Little Capital, Has Developed a Permanent and Growing Business, a Clearing House for Other Truckers, and Has Six Highest Grade New Trucks Working Constantly.**

**H**AULAGE contracting with animal vehicles has been engaged in the world over, and very generally with success, but comparatively few of those who have business of this class have regarded motor trucks with favor, although they may have had varying experience with them. The average contractor engaging in haulage by the hour, day or term, or by the job, will maintain, if he uses trucks, that the vehicles have capacity and speed, but he can only utilize them according to the conditions, and the time lost from congested traffic, from inadequate loading or unloading platforms, or from any cause that prevents them being more continuously used, is too great for them to be an economy.

This is the story of two men, the one a thorough mechanic and driver, and the other blessed with a knowledge of accounting and what it means, who, starting with a single used truck and no customers, have in but little more than a year established a substantial business, based largely on yearly contracts, and have six new trucks. Not only

this, the company hires additional trucks from time to time to meet the demands of its customers, and serves as a clearing house for other truck owners, supplying vehicles to those who have intermittent use for them, and receiving commissions from the owners of the machines from whom work is found.

What has been accomplished has been due to three factors—hard work, good service for their customers and a system of accounting that is remarkably complete. The company has purchased its trucks on credit, it is true, but all payments have been met and the prospects, with substantial contracts for work, are more than good. Either of the members of the company will affirm without hesitancy that the success won has been due directly to records, which impelled

efficiency and economy, and these have been summarized in charts that are based on revenue.

The concern is the Thayer-Griffith Company, now a corporation, at 8 Camden street, in the Roxbury district of Boston, and it began business April 15, 1915. The company is a haulage con-



A Thayer-Griffith Company's Power Dumping Truck Used in Contract Work by a Boston Building Wrecker.



One of the Works Where the Loading Is by Hand and Is Necessarily Slow, but Where Speed and Capacity Count.

tractor in the best sense of the term, but it confines its operations to what is known as the Metropolitan district, which may be roughly stated to be a radius of approximately 10 miles from the State House in Boston in a direct line.

#### One Partner a Practical Man.

Mr. Thayer is the practical mechanic and truck man of the company. He worked for five years driving pleasure cars, for two years he was an expert mechanic and tester for an automobile concern, and about four years ago he was engaged by the Metropolitan Coal Company of Boston to have mechanical supervision of the trucks that concern used in the haulage of coal. As he was with the coal company for three years his practical experience with automobile vehicles extended over a period of more than 10 years before he engaged in business.

#### Operated Truck with Hired Driver.

The company kept its trucks a part of the time in the service station of the General Motors Truck Company in Albany street, and while Mr. Thayer was in the station he learned that many business men called the office for information when in need of truck transportation. That is, concerns that could not do their work with their own equipment and required supplementary haulage, would endeavor to ascertain where they could hire machines for temporary service. As these requirements ranged from a few hours' work to contracts for several months or indefinite periods, he believed that a profitable business could be developed by a man who owned one or more trucks, who was known and could be reached readily.

He purchased a used Garford

truck, a machine that had seen better days, but was all that his limited capital would justify purchasing, and this he kept at the General Motors Truck Company's station and hired a driver to operate it, he finding work for it among business men. He continued his employment with the Metropolitan Coal Company and gave over his nights to working on the truck or seeking work for it. He learned from experience that there was a demand for trucks—a far greater demand than he had anticipated—and with this assurance he decided to operate his own truck rather than, as he expresses it, "working all day in the coal yard and working all night to keep the old truck

in condition for the other fellow to drive."

Once established as a contractor, Mr. Thayer believed that there were good possibilities provided that he had another truck available and a man operating it who had as much interest in promoting and developing business as himself. He had no capital to invest, however, and the only possibility of development was through a partnership with a man who might have the required resources. Mr. Thayer was satisfied that he could direct the work of machines and keep them mechanically operative, but he was not experienced with office work, and he could not be in the office and work a truck at the same time. He was at that time making his headquarters at the station of the General Motors Truck Company.

Mr. Thayer advertised for a partner, and the result was his meeting Mr. Griffith, who was employed by the United Shoe Machinery Company. Strangely enough Mr. Griffith was not in the least familiar with highway transportation. He was an accountant, hav-



Saving the Time of the Trucks in Building Wrecking by Loading Them with Chutes So Far as Possible.



ing had experience in the employ of Louis Sherry, a well known New York restaurant proprietor, before locating in Boston, and was well versed in business methods and usages. He had a limited amount of ready money to invest. The partnership was formed in the name of the Thayer-Griffith Company, and determination was that Mr. Thayer should drive a truck and direct the operating and Mr. Griffith should have charge of the office and the general details of the business.

#### **Bought Used Packard Truck.**

The partners realized that one truck was not sufficient equipment, and so a used Packard three-ton truck was bought, cash and notes being given in payment for it, this leaving the company with reduced capital, but doubled haulage capacity. A little office was rented in West Springfield street, a telephone installed, and while Mr. Thayer and a driver worked the two machines, Mr. Griffith developed a system of records, canvassed actively among business firms that might require contract work, and sought to make the company known. One care was taken—that there

The company decided to make prices for four classes of work—the hour, the day, the thousand (for brick) and the ton being the bases. With these any job or contract could be undertaken and a price given that would be understood by business men. The company sought to give service of any kind, no matter what the character, that was within the Metropolitan district. The hours were long in many instances because, aside from the contract work, the calls were often emergency hauls and were incidental, but were given careful attention, because both Thayer and Griffith believed that the company must be known to obtain substantial patronage, and regarded as dependable before it would be relied upon for service.

One of the principal factors in contract haulage is the standard of work—that is, the freight or tonnage that can be hauled in a given period, for the business man seeks economy and to justify a contract the price must be so low that he cannot afford to operate his own equipment, and yet it must yield a profit to the contractor. Of course the operation of large trucks means that the loads as near capacity as is practical



**Five of the Six Trucks of the Thayer-Griffith Company, Equipped with Hydraulic Hoists for Quick Discharging, and Steel Bodies for Doing General Haulage.**

should always be some one in the office to give inquirers information, and a surprising number of calls were received, even in the first days of the firm's existence.

One of the first works was for the Winchester Brick Company, Winchester, Mass., which was for a man who had done haulage for that concern for a considerable length of time with a verbal agreement. The price paid was not sufficient to justify continuance, however, and absence of the truck led to inquiry by the firm for the reason. Explanation was made that the price was inadequate and an adjustment followed so that the work was resumed.

#### **First Contract Entered Into.**

The brick company, however, then took up the subject of price and was informed that while what was paid was satisfactory, that a more satisfactory agreement could be made were a contract entered into. The proposition was favorably received and the first contract was made, this being for a year. With this as a basis, and with the construction operations of the spring developing, there was more demand for trucks, and a second used three-ton Packard truck was bought, this bringing the equipment to three machines.

must be carried when the charge is by the ton, for partial loads relatively increases the cost.

#### **Second Contract Is Made.**

The next contract made was with a concern that cuts expensive stone block paving, which is extensively used on private estates, and called for the haulage of about 1000 tons of chip stone each month aside from other work. This was made when the stone company learned that it could obtain a better figure when its work was assured than when done merely as jobbing.

With this contract the company bought a used Peerless machine, trading the Garford in part payment, this giving it three trucks. Because every endeavor had been made to bring the company and its service to the attention of business men, the demands for machines occasionally exceeded the possibilities of the company's equipment, and this necessitated hiring trucks to meet them. Quite a number of truck owners were found who had more or less idle time and were seeking work.

These owners were listed, record being made of the names, addresses, the capacities of the trucks, the

types of body equipment, the practical means of telephone communication, and such other data as would serve a useful purpose, so that the company could, if necessary, obtain machines to meet any emergency demand. All work obtained for other truck owners was charged the regular rates, and after collections were made the truck owners were paid by the company, this simplifying all transactions and maintaining close relations with the customers. The outside truck owners simply did work for the Thayer-Griffith company and were paid by it, this policy insuring satisfaction for all customers, giving the truck owners work for which they received a satisfactory price, and preventing complications. The charge of the Thayer-Griffith company for serving as a clearing house, finding work, making the collections, etc., was 10 per cent. The work that was expected or demanded was understood and care was taken to meet these expecta-

with horses that it was profitable to make contract.

The affairs of the company were in a state of transition. The office was removed from West Springfield street to 8 Camden street, where there were more conveniences and a place for storage of a small stock of supplies. The company was increased by the admission of a third partner, and then it was incorporated. The trucks were changed from the service station of the General Motors Truck Company to that of the Baker Motor Sales Company in Green street, Cambridge. Next, as the business justified, the used trucks were exchanged in part payment for new machines. First a four-ton Packard truck was acquired, then a five-ton Pierce-Arrow truck, and this was followed by three more five-ton Pierce-Arrow trucks and then a second four-ton Packard truck, so that all of the machines now in service are new.

One of the necessities of a haulage contractor is quick discharging bodies, and all of the new trucks are equipped with hydraulic hoists, by which the bodies can be elevated and discharged and lowered in 33 seconds. This lessens the work of the drivers when making deliveries. If the customers will afford facilities for quick unloading, practically no time need be lost, and the machines can be kept moving continuously. Because of the limited capital of the company these trucks were bought by time payments, but the resources were such as to satisfy the representatives of the truck manufacturers, and the possibilities of the business justified the investment.

The company has leased for five years a new garage building that will store 10 trucks and a touring car at 24 East Concord street, which is being fitted for its occupancy, and which will be ready for use about June 1. The intention is then to remove the office to the garage. Quite recently the company purchased a Packard touring car, which is used for making collections, soliciting business and keeping track of the working trucks, for besides its own equipment it now has from two or three to six or eight other trucks busy. Besides this, there is often occasion to carry supplies to trucks that have need of gasoline, oil, or sometimes require adjustment or small repair, which can be made on the road, and which prevents operation for the time being.

#### Make Contracts with Drivers.

The time of the members of the company and of the trucks that can be saved makes the car a necessity instead of a convenience, and the cost of its maintenance is productive of decided economy. For about eight months Mr. Thayer drove a truck, but the in-



**The Loading Is Slower as the Structures Are Demolished and the Material Must Be Handled by Men Piece by Piece.**

tions so far as practical. That is, all customers could consistently expect that any price fixed was reasonable and no time was lost, the responsibility for loading, unloading, routes traversed to avoid congestion, etc., being determined by the company. There was also better satisfaction obtaining when the customers felt they were dealing with a responsible firm, with which they could have continuous relations, rather than seeking truck men unknown to them whenever there was excess haulage to be done.

#### Contract with Building Wrecker.

The next contract made was with the Swift-McNutt Company, building wrecker, and this was the result of persistent solicitation, for this concern owned and was using horse teams and trucks and carts. A truck was hired to do emergency work, and the result was so satisfactory that it was used continuously for a period. Then when a price was established, based on continuous work, the contract was signed. This engagement was not made, however, until the Swift-McNutt Company was satisfied from its own records

crease in the equipment impelled him to devote his time to supervision, both of maintenance and work, and a driver was hired for the truck he had driven.

The company hires high-grade drivers, engaging them by the day, and making contract with them. The drivers are required to devote their idle time to work on the trucks and to work every fourth Sunday on the machines in the garage. They report at the garage at 6:30 mornings, which allows them 30 minutes to reach their work and report with their machines at 7 o'clock. They are paid overtime at the rate of 50 cents an hour for work they may be assigned to after 6 in the evening.

By this is meant that if they are delayed reaching the garage by accident or mishaps they would not receive overtime, but if they are given extra work they are paid for their time at the rate stated. One of the provisions of the contract is that no one is allowed to ride with the drivers on the trucks, which is a precaution against accident and insures that the drivers have nothing to detract their attention from their work.

#### Drivers Care for Trucks.

The drivers oil and grease the trucks they drive, fill the fuel and water tanks, and make adjustments or such minor repairs as are practical with the hand tool equipments of the machines, but when repairs are needed that require other tools or facilities, the trucks are sent to the service stations of the makers, for there the work will be well and quickly done and guaranteed. The reason for this policy is that the time of the trucks is valuable and repairs must be rushed, although the workmanship must be the best obtainable. When a machine is not serviceable there is a distinct loss, and not only this, equipment must be depended on when making engagements with customers.

The trucks are not overloaded. Care is taken to keep the freights to the load capacities of the machines, Mr. Thayer maintaining that this is fuel, tire and upkeep economy, and his opinion is based on long experience. He gives the machines his personal attention, both in the garage and on the road, and sees to it that nothing that will insure mechanical efficiency is neglected. The trucks are frequently inspected in the garage, and they are gone over thoroughly at least once in four weeks. Whenever necessary work is done on them nights. When the company is in its new garage the purpose is to hire a mechanic who will devote his time to the trucks exclusively, who will work nights and will serve as watchman as well, who will have such tool equipment as may be essential for satisfactory adjustment and minor repairs. But the major repairing will be done at the service stations of the makers for the reasons stated.

#### Some Quick Body Changes.

The trucks of the company are equipped with quick discharging bodies, but very frequently work in prospect requires either platform or express bodies. Mr. Thayer says that he has never yet failed to have a truck for a customer when promised, but he has had some strenuous experiences getting machines. In one

instance a man wanted a large job of stone hauling done that necessitated the use of a platform body. He promised a truck the following morning at 7 o'clock, and after trying for hours to find one he went to a lumber mill and had the wood stock for a body cut. He obtained bolts and nails and such irons as were necessary and built a body in four hours after the materials were ready. One of the dumping bodies and the power hoist were taken from the chassis of a truck and the next morning the machine was on the job with a platform body. The cost for the materials was \$16, and there was a big profit because of the urgent nature of the job. Later on he was offered \$75 for the body, even though it was a rush work.

### DRIVERS' DAILY RECORD CARD

Truck No. .... Date .....

Gallons Gasoline .....

Purchased From .....

Pints Motor Oil .....

Pints Gear Oil .....

Miles Run .....

Total Mileage .....

Tonnage Carried Out .....

" " In .....

Number of Stops .....

Tire Replacement .....

Net Running Time .....

Repairs .....

Remarks .....

.....

.....

.....  
Driver's Signature

The Driver's Daily Record Card on Which the Summary of the Work Done Is Turned Into the Office.

When the work for the truck was completed the platform body was drawn off the truck chassis by attaching a rope to it and to a large post and driving the truck ahead. Restoring the dump body on the Packard chassis was quite as peculiar an undertaking. The body weighed about two tons and it was in a coal yard. With a pneumatic jack the forward end of the body was lifted and blocked until it was nearly in a position to topple backward. Then the truck chassis was backed to and against the body, and a heavy rope was made fast to the eyes for the cable for the power hoist. This rope was wound around the jackshaft and the engine was started, and as the chassis moved forward the forward end of the body was drawn down

<b>DELIVERY RECEIPT</b>	
FOR GOODS DELIVERED BY	DATE _____
<b>THAYER-GRIFFITH CO.</b>	
ROSTON, MASS.	
TO _____	
AT _____	RECEIVED IN GOOD CONDITION
TRUCK NO. _____	QUANTITY _____
DRIVER _____	SIGNED _____
CHARGE TO _____	

**Delivery Receipt, Which Establishes All Responsibilities and Accounts for Freight of Value Hauled.**

on to the frame. While the body was held by the rope it was secured so that it could not drop, and by backing the end of the body against a stout post the body was forced on to the frame. Bolting it fast was then an easy matter. The restoration of the body to the chassis was a two-hour job for one man, but it was hard work.

#### Records Very Complete.

Reference has been made to the records of the firm, which have been developed by Mr. Griffith to serve his own purposes. Those which have to do with the operation of the trucks are specially interesting, for they are simple and very carefully worked out. One should understand that there are the usual ledger accounts, and a record of bills payable and receivable, but other than these there is a cash book, which deals with the revenue from and expenditures for each truck, an operating record that summarizes the work of each machine and shows the cost and the income, and individual records of each vehicle that includes all of the data shown by the cash book and the operating record, with driver's record card, time vouchers and delivery receipts.

When a machine is purchased the individual record is begun in a small book that is devoted entirely to the vehicle, and which is filled from day to day after what may be regarded as the constants have been established. The constants begin with the company's truck number and include the manufacturer's chassis number, the capacity, equipment, cost, manner of investment and other detail, and the fixed charges that are to be carried through are established. Then is entered daily the work done, the receipts, the expenses and the different items from which totals are obtained.

The driver's record is obtained from a daily record card on which is entered each day a report, which shows the truck number, the date, the gasoline, the lubricating and gear oils purchased, the number of miles driven, the total mileage, the

tonnage carried out and the tonnage carried in, the number of stops, the tire replacements, the net driving time, the repairs made and remarks, which are attested by the drivers' signature. The driver returns a time voucher for every job on which he works, which gives the date, the truck number, the time start was made, the time work was ended, the number of hours worked, the number of hours lost, which is signed for by the foreman or individual directing the work of the machine, and the name of the firm to whom charge for the truck shall be made.

The purpose of the voucher is to insure against overcharge of the customer and to check the time of the driver and the machine. There is also a delivery receipt which shows the date, the name and address of the concern or person to whom delivery is made, the number of the truck, the name of the driver, the quantity of freight and whether or not it was received in good condition, which is signed by the receiver, and the name to which charge for the work shall be made. This accounts for any freight carried and shows that it was received and establishes the charge. The time voucher is used where the work is by the hour or day, and the delivery receipt is used when the work is by the job or thousand. The responsibility of the company for claims for damage or breakage is established by the delivery receipt.

One purpose is to obtain accuracy in every detail of work done, so that there shall be no question arise that cannot be determined equitably, and that there shall be no loss or uncertainty. Misunderstandings are averted and satisfaction is assured through fixing responsibilities.

#### The Operating and Expense Record.

The operating record is a book in which two pages are allowed for each truck for a month, and every day is accounted for. In columns arranged in this order the record is entered daily, this being in effect a summary: Date, miles per day, gallons gasoline bought, cost; quarts oil bought, cost; grease, storage, wages,

<b>BOSTON, MASS.</b>		<b>CHARGE</b>
DATE _____		
<b>THAYER-GRIFFITH CO.</b>		
8 CAMDEN STREET,		PHONE, ROXBURY 3170
<b>TIME VOUCHER</b>		
TRUCK NO. _____		
TIME STARTED _____	HOURS WORKED _____	
TIME STOPPED _____	HOURS LOST _____	
SIGNED _____		

**Time Voucher, Which is Used to Determine Definitely All Working and Idle Time, and to Whom the Charge is Made.**

driver (name), sundry expenses, total expenses, receipts, loss and profit. This record is for every day, but the only entries made for Sundays are those of storage, which is continuous, and for holidays those of storage and wages.

The record is totalled at the end of the month and this summarizes for that period the mileage, the quantity of gasoline bought and the cost, the quantity of oil bought and the cost, the grease bought and the cost, the cost of storage, the cost of the driver, the cost of the sundry expenses, the total expense, the total revenue, the loss (storage and wages for Sundays and holidays) and the profit.

The cash book record extends across two pages and it includes in this order the expenditures for gasoline, oil, grease, tires, wages, repairs, payments on trucks, storage, rent, stationary, equipment, hired trucks, expenses, sundries and total. This record includes all of the machines and represents the expenditures for the entire business. The totals of the entries across are entered in the total column, and the total of this column and of the footings of the different columns must agree.

#### Variable and Fixed Operating Costs.

The trucks are depreciated on a basis of 100,000 miles, or approximately 20 per cent. the year. The estimated cost of the variable expense a mile is as follows:

Tires, on 7000 mile basis.....	\$0.0552
Gasoline, 4.24 miles the gallon, at \$0.1997 a gallon.....	0.0466
Motor oil, 169 miles the gallon, at \$0.3430 a gallon.....	0.0029
Other lubrication .....	0.0006
Repairs and upkeep.....	0.0310
Depreciation at 100,000 miles.....	0.0450
<b>Total.....</b>	<b>\$0.1804</b>

The fixed charges are the following:

Interest at six per cent. the year.....	\$309
Insurance, fire, theft and liability.....	223
Garage, at \$12.50 a month.....	150
Driver, 50 weeks at \$21 a week.....	1050
<b>Total.....</b>	<b>\$1732</b>

This makes the average of the fixed charges \$5.77½ a day, to which must be added the cost a mile, as shown in the estimate of variables, which is, at the price of gasoline quoted, \$18.04 for each 100 miles driven. With the present price of gasoline, for the estimate was made when slightly less than 20 cents was paid, the cost would be somewhat increased. Obviously, with the value of fuel fluctuating no estimate can be made for any considerable period of time, but the method of determining expense of operation is evident.

Taking the mileage records of the company one will find that the distances driven daily will considerably exceed the transportation requirements of the average business, which will be from 35 to 50 miles. During a period of 26 working days from Nov. 9 to Dec. 9, inclusive, of last year, the Pierce-Arrow truck No. 4 of the company was driven 1946 miles, an average of 74.8 daily, the minimum being 29 miles and the maximum 104 miles. On 16 days the mileage was in

excess of the average, while on 10 days the average was not reached. This month's mileage is exceptional, of course, but it serves to show that the company works the machine with a view of getting returns and affording service.

#### Truck Efficiency Charts.

One of the means of determining the relative productiveness of the different trucks is an efficiency chart, which is made up with a record for each machine. This consists of a large sheet ruled into squares, a section of the sheet being devoted to each truck. Each section extends across the sheet, defined by heavy lines, and the sections are divided by lines which are central between these heavy lines. The central lines represent the "\$20" level, or the standard from which efficiency is determined.

The sheets are ruled vertically so that each division represents a day, and these spaces are dated to specifically designate them. When the chart was begun lines were drawn from points representing the earnings, either above or below the central or "\$20" level, and each day these lines have been continued. In other words, the earnings of the trucks are shown by curves with \$20 as the standard. Of course the curves vary greatly because the trucks have been occasionally idle for a day or two, or on holidays, and in one month the daily earnings have ranged from \$11.25 to \$42.70. But uniform receipts would not be possible unless the machines were rented to constant work and no other jobs were undertaken.

With this efficiency chart the production of each machine can be followed closely, this being another method of comparison that has been found equally as satisfactory as figures. The company has made no endeavor to engage in haulage of light loads, for the cost of operating small machines is so much greater in proportion than are those in service that the revenue is much decreased in comparison. The purpose of the company is to add to its fleet of trucks as demands upon it increase, but the size of the garage leased will indicate that the operation of a large number is not seriously regarded, so long as rentals will provide for emergency needs.

The new garage will be used for the storage of the company's trucks and for the machines operated by an oil and fuel company, and the income from this will, in all probability, practically pay the rental of the building. As the company purchases its oils and fuel from this concern the arrangement will continue no doubt until the garage is required for the exclusive use of the Thayer-Griffith Company.

#### NEW CANADIAN TRUCK COMPANY.

Hall Motors, Ltd., is the name of a company which is to undertake the manufacture of trucks in Canada. A plant has been secured at Markham, near Toronto, and a production of between 400 and 500 trucks is being arranged for the first year. Work will begin some time in March.



## SMITH STEEL TRUCK WHEELS.

### Types with Hollow Felloes and Spokes That Are Single Castings.

Smith steel truck wheels, made by Smith Wheel, Inc., of Syracuse, N. Y., are claimed to have many advantages for truck use, not the least of which is that they are always rigid and in true, so that tires will last



A Smith Cast Steel Wheel Designed for Front Axles, Ready for Installation of the Hub.

40 per cent. longer on them than on wooden wheels.

The wheels are cast in one piece, with hollow felloe and spokes. They weigh about as much as a wooden wheel of the same size and have several times the strength. Wood is a very poor conductor of heat, with the result that much of the heat generated in the tire by use and by friction with the ground remains there to soften and deteriorate the quality of the rubber, while the claim is made that with the steel this heat is conducted away.

Repairs and rebuilding, which are occasionally necessary for wooden wheels, are never required for steel wheels. The wheels will bear several times the weight the truck itself will support.

Smith wheels are made in one piece with a hollow hub, spokes and felloe, which eliminates joints in which dirt and moisture might collect and makes possible a smoothly curving and neat exterior. The hub and felloe contain respectively 48 and 96 properly located braces of suitable size.

Single spoke sections are subjected to a pressure of 30 tons, which is the capacity of the testing machine, without showing the slightest sign of distortion. As the load is always carried by six spokes, three upper and three lower, this gives some idea of the strength of the complete wheel. Pressure applied to the hub while the wheel is lying flat reaches 30 tons before a deflection of  $\frac{1}{4}$  of an inch is effected. When the weight is removed the wheel will return to its original shape.

The material from which these wheels are made is an alloy which has been in use for 30 years in parts subject to great vibration without a single recorded failure from crystallization or fatigue.

European manufacturers have used metal wheels on trucks for a number of years, but the service has not always been satisfactory, because of faulty design and defective material failures were sometimes caused by crystallization. Improved design and perfected methods of manufacture have greatly increased the efficiency of cast steel wheels and they are very generally used. Very high claims are made for endurance and economy of such equipment with heavy vehicles.

Wooden wheels were discarded by some builders of Europe because suitable wood was scarce and the prices were high; because tire makers objected to a tendency of wheels to change shape with different degrees of moisture and dryness in the atmosphere, as well as their distortion through constant use under heavy loads.

When experiments were begun with the Smith wheel about a year ago they were placed on trucks of various makes and given severe service tests. Some of the users found that they increased tire wear as greatly as 40 per cent. Two prominent truck manufacturers, the White and Locomobile companies, have been using steel wheels for some time, but these have been manufactured specially for them.

One of the effects of the wooden wheel when it is out of round is to increase strain and wear on the bearings, shafts, motors and all parts of the truck mechanism.

The Smith wheel has been tested and approved by a number of the most prominent engineers in the industry. They have been adopted for Chase trucks and the machines will soon appear equipped with them. The company producing them has bought additional machinery and is preparing for a large volume of business from the truck makers.



Smith Cast Steel Wheel with Dual Tire Adapted for Service on Trucks of Large Capacity.

**NEW YORK MOTOR LEGISLATION.**

The New York legislature has made it a misdemeanor to place on the roads tacks or glass or any other article that would be likely to damage the tires of an automobile or injure the feet of an animal. A joint legislative committee of two senators and three assemblymen is to be appointed to investigate the use of lights on automobiles and various devices for eliminating glare with a view to preparing legislation on that subject.

**CLARE MANAGES ATTERBURY SALES.**

W. A. Clare, formerly assistant sales manager for the Chase Motor Truck Company, Syracuse, N. Y., has joined the Atterbury Motor Car Company of Buffalo, N. Y., as sales manager. His duties under H. T. Boulden, sales manager for the Chase company, included editing the house organ "Chase-Em," and supplying dealers and salesmen with sales information.

**NEW INSURANCE ORGANIZATION.**

Fire insurance companies which write fire and theft insurance on automobiles have formed a new national organization for the purpose of making rates. The organization is known as the National Automobile Underwriters' Conference. Its constitution has already been approved by a number of companies which did not participate in the association previously formed for the same purpose.

**PEERLESS TRUCK AND MOTOR DIRECTORS.**

The annual meeting of the Peerless Truck and Motor Corporation, which was held in Richmond, Va., April 4, re-elected the following directors: C. V. Rich, vice president of the National City Bank of New York and president of the National City Company; E. R. Tinker, Jr., vice president Chase National Bank; P. J. McIntosh, 26 Broadway, president of the General Gas Appliance Company; B. G. Tremaine, F. S. Terry, National Lamp division of the General Electric Company; P. D. Wagoner, president General Vehicle Company; L. H. Kittredge, president Peerless Motor Car Company; Harrison Williams, Cleveland Electric Illuminating Company; E. W. Hargen, T. W. Frech, vice president Peerless Motor Car Company, and Harvey Hook. The company's present manufacturing policy will continue.

**WILL COMBAT TRUST PRICES.****Automobile Manufacturers Back Company to Make Gasoline for Fair Profit.**

An oil company to produce gasoline and other petroleum products has been incorporated in New York by interests identified with the National Automobile Chamber of Commerce. It is understood to have the financial and moral backing of 100 members of the chamber.

John A. Royall, an oil man of long experience, is said to have suggested the scheme, which is to organize a large producing company to provide gasoline in considerable quantity. It will be sold at prices which will yield a legitimate profit, but as all stock will be held by automobile interests, they will use it rather to secure gasoline at reasonable prices than to make money out of the oil company.

The purpose of the company is to provide the motor car manufacturers and the public with the facts regarding the cost of gasoline production, in order to aid in legislative regulation or any other pressure that may be brought on the established oil companies to produce gasoline that can be sold at a moderate price. It is the result of a belief on the part of automobile men that the present high prices are caused as much by manipulation as they are by natural conditions.

It is the hope of its promoters that the company will serve to stabilize prices. If prices are high it will sell fuel at only a reasonable price, and if a price war takes the price for other companies below a paying level, it will still maintain the normal price. Its promoters do not hope to make or sell all the automobile fuel used.

The following officers of the Locomobile Company of America were elected at a recent meeting of the board of directors: President, Raymond K. Albright; vice president, Andrew L. Riker; vice president, James T. Roche; secretary and treasurer, Frank R. Hickman.



Fleet of Eight 3½-Ton General Vehicle Electric Trucks Loaded with Grain in Service in South Africa.

### CITIES SLOW BUYING TRUCKS.

Cities have been slower than private businesses buying trucks for their work and T. J. Hudson, manager of the truck department of the Chicago Pneumatic Tool Company, which makes Little Giant trucks, believes the reason to be that officials fear criticism on the ground of extravagance and have kept away from trucks until the business community should be convinced of the economy.

It is significant, therefore, that cities have recently begun to buy trucks in considerable number.

### GASOLINE MEASURING DEVICE.

A device for measuring gasoline and for filtering it while flowing from the storage tank into the vehicle tank, has been patented by W. C. Lindsay of the Lindsay Garage, Newport, Vt., which is in effect a



The Lindsay Gasoline Gauge for Installation on a Storage Tank Pump.

float gauge through which the fuel flows from the storage tank pump, and which registers the volume of liquid in the gauge, the quantity being indicated by an arrow against a dial board below it and plainly in view of the customer.

The float accurately operates the pointer against the dial board and shows the volume flowing in or out. By opening an ordinary valve the gauge is quickly filled and the quan-

tity of liquid entering it is absolutely controlled. By a similar valve in the nozzle at the end of the hose the outlet is similarly controlled, so that the contents may be discharged slow or fast as desired.

Gasoline may be elevated to the gauge from the storage tank in the ground by hand or power pump, air pressure, hydraulic pressure or by gravity fall. The gauge as shown in the photograph is operated by air pressure. It may also be connected with a hand pump for experimental purposes.

The Chase Motor Truck Company, which until very recently had few representatives in New England, has been rapidly expanding its organization there and has greatly increased its New England business. The sales of the company for the past few months have been making records for monthly production.

### STANDARD TESTS FOR TIRE FABRICS.

Different testing methods used by buyers of fabric used in automobile tires has caused much confusion because the conditions in which the fabric was tested for tensile strength gave widely varying results.

The amount of moisture in the cloth, and the weather influenced results so that the same fabric might either fail to meet requirements or show more than the necessary strength, according to conditions.

To standardize the tests and so avoid this uncertainty the bureau of standards at Washington has worked out a method of testing the cloth when it is bone dry, which should yield accurate results. This is fully described in No. 68 of the Technological Papers issued by the Bureau of Standards, which is sold for 10 cents.

### REJECT LARGE AMOUNT OF STEEL.

During the past year the Timken Roller Bearing Company, Canton, O., and Detroit, Mich., has rejected 1,000,000 pounds of steel received from mills because it did not meet exactly the specifications required, being too high or low in carbon or sulphur. The rejections were made in spite of the fact that steel of good grade could be obtained with difficulty and buyers of bearings were clamoring for as many as they could get.

### BIG OWNERS BUY MORE TRUCKS.

Operators of large fleets of motor trucks are adding rapidly to those they own at present and are creating a volume of truck business greater than any that has previously existed, according to C. R. Norton, truck sales manager of the Packard Motor Car Company. The Adams Express Company recently purchased 20 three-ton Packard chainless trucks for use in New York and Philadelphia.

### KISSEL TRUCK AT THE MINES.

The value of motor trucks in mountain mining country was shown recently when a Kissel one-ton worm drive truck was loaded with 46 boxes of powder at Boulder, Col., and driven a mile up the canyon. It made the distance over a continuous up-grade in three minutes and 50 seconds. Four horses were one hour and 25 minutes hauling a similar load over the same road.

The difficulty of getting materials and the higher prices for them and for labor are bringing about an increase of from five to 10 per cent. in the price of farm tractors. The Avery company of Peoria, Ill., has announced a raise and a similar increase has been made in all tractors made by the Emerson-Brantingham Implement Company of Rockford, Ill.

# MOTOR TRUCK MODELS, CAPACITIES AND PRICES.

Alphabetical Arrangement of the Manufacturers and Indices of the Pages on Which the Specifications of Their Products Can Be Found.

<b>Acson Motor Truck Co., Detroit, Mich.</b>					<b>V 3</b>					<b>H</b>				
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3 1/2	7000	.....	.....	176	<b>Buick Motor Co., Flint, Mich.</b>					<b>Detroit Commer. Car Co., Pontiac, Mich.</b>				
<b>Adams Truck, Fdy. &amp; Mch. Co., Findlay, O.</b>					Model	Cap.	Chas. Price	Comp.	Page	Model	Cap.	Chas. Price	Comp.	Page
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E C	5000	\$2800	.....	173	<b>Chase Motor Truck Co., Syracuse, N. Y.</b>					J 3	4000	\$2200	.....	170
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<b>Atterbury Motor Car Co., Buffalo, N. Y.</b>					O	7000	\$3300	.....	176	<b>Doane Motor T. Co., San Francisco, Cal.</b>				
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6 R	3000	\$1875	.....	167	H	1200	\$815	\$865	163	1916	12,000	.....	\$4500	180
6 C	4000	\$2375	.....	169	K	1500	\$840	\$895	163	<b>Dominion Motor Truck Co., Detroit, Mich.</b>				
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<b>C. L. Barker, Norwalk, Conn.</b>					Tractor	.....	\$5000	.....	180	E	15,000	\$4950	.....	180
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V	5000	\$1750	\$1850	173	C B 1/2	3000	\$1750	.....	167	<b>Eclipse Motor Co., Cleveland, O.</b>				
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2 E	8000	\$3750	.....	177	A	7000	\$4800	.....	176	O	2000	\$1800	.....	165
2 F	10,000	\$4250	.....	178	A C	10,000	\$5200	.....	178	M	3000	\$2300	.....	168
<b>Bollstrom Prod. S. Co., Battle Creek, Mich.</b>					<b>Croce Automobile Co., Ashbury Park, N. J.</b>					Q	4000	\$2600	.....	170
Model	Cap.	Chas. Price	Comp.	Page	Model	Cap.	Chas. Price	Comp.	Page	<b>Garford Motor Truck Co., Lima, O.</b>				
A	1500	\$1200	.....	163	16	1000	\$800	.....	162	Model	Cap.	Chas. Price	Comp.	Page
<b>Bowling Green M. C. Co., Bowling Green, O.</b>					..	3000	\$1900	.....	167	6-4	1500	\$1350	.....	163
Model	Cap.	Chas. Price	Comp.	Page	..	5000	\$2600	.....	174	75	2000	\$1450	.....	165
T	2000	.....	.....	166	<b>Crowther Motor Co., Rochester, N. Y.</b>					66	3000	\$1800	.....	168
N	3000	.....	.....	168	Model	Cap.	Chas. Price	Comp.	Page	70	4000	\$2300	.....	170
R	4000	.....	.....	171	L D	1000	.....	\$600	162	77	7000	\$3400	.....	176
B	7000	.....	.....	177	<b>Dart Motor Truck Co., Waterloo, Ia.</b>					D	10,000	\$4300	.....	178
<b>Briscoe Motor Co., Jackson, Mich.</b>					Model	Cap.	Chas. Price	Comp.	Page	F	12,000	\$4500	.....	180
Model	Cap.	Chas. Price	Comp.	Page	B B	1500	\$1300	.....	163	<b>Gary Motor Truck Co., Gary, Ind.</b>				
L. Deliv.	1000	.....	\$585	162	B	2000	\$1400	.....	165	Model	Cap.	Chas. Price	Comp.	Page
<b>Brockway M. Truck Co., Cortland, N. Y.</b>					C	4000	\$1900	.....	170	E	1500	.....	.....	163
Model	Cap.	Chas. Price	Comp.	Page	C C	5000	\$2100	.....	174	H	4000	.....	.....	170
O	2000	\$1450	\$1500	181	<b>DeKalb Wagon Co., DeKalb, Ill.</b>					H	4000	.....	.....	170
H	2500	\$1600	.....	181	Model	Cap.	Chas. Price	Comp.	Page	<b>G. A. Schacht M. Tk. Co., Cincinnati, O.</b>				
J 2	3000	\$1825	\$1885	181	D 1	3000	\$1950	.....	167	Model	Cap.	Chas. Price	Comp.	Page
I	4000	\$1900	\$1988	170	D 2	5000	\$2450	.....	174	2 Ton	4000	\$2800	.....	172
K 2	5000	\$2125	\$2213	174	<b>Denby Motor Truck Co., Detroit, Mich.</b>					3 Ton	6000	\$3200	.....	175
<b>Buckeye Mfg. Co., Anderson, Ind.</b>					Model	Cap.	Chas. Price	Comp.	Page	<b>General Motors Truck Co., Pontiac, Mich.</b>				
Model	Cap.	Chas. Price	Comp.	Page	R	2000	.....	\$1020	165	Model	Cap.	Chas. Price	Comp.	Page

40	4000	\$2375	.....	170
41	4000	\$2375	.....	171
70	7000	\$3300	.....	176
71	7000	\$3300	.....	176
100	10,000	\$3850	.....	178
101	10,000	\$3850	.....	178

General Veh. Co., Long Island City, N. Y.				
Model	Cap.	Chas. Price	Comp.	Page
FV	12,000	.....	.....	180

Geneva Wagon Co., Geneva, N. Y.				
Model	Cap.	Chas. Price	Comp.	Page
1	1500	\$700	\$750	163

Gerlinger Motor Car Co., Portland, Ore.				
Model	Cap.	Chas. Price	Comp.	Page
C	5000	\$2500	.....	174

Globe Furniture Co., Northville, Mich.				
Model	Cap.	Chas. Price	Comp.	Page
..	2000	\$1085	.....	164
..	2000	\$1175	.....	165
..	2000	\$1275	.....	165

Gramm Bernstein Co., Lima, O.				
Model	Cap.	Chas. Price	Comp.	Page
1	2000	\$1600	.....	165
1½	3000	\$1900	.....	168
2	4000	\$2300	.....	171
2½	5000	\$2600	.....	174
3½	7000	\$3400	.....	176
6	12,000	\$4500	.....	180

C. F. Hanger Co., Cleveland, O.				
Model	Cap.	Chas. Price	Comp.	Page
B	1000	\$875	.....	162

Hannibal Motor Car Co., Hannibal, Mo.				
Model	Cap.	Chas. Price	Comp.	Page
A	1000	\$550	.....	162

Harvey Motor Truck Co., Harvey, Ill.				
Model	Cap.	Chas. Price	Comp.	Page
W F	4000	\$2250	.....	171
W H	7000	\$2950	.....	176
W K	10,000	\$3600	.....	178

Henderson Bros., No. Cambridge, Mass.				
Model	Cap.	Chas. Price	Comp.	Page
C	1200	\$1120	.....	163
D	2000	\$1500	.....	165

Hewitt-Lud. Anto Co., San Francisco, Cal.				
Model	Cap.	Chas. Price	Comp.	Page
..	1500	\$1650	.....	164
..	2000	\$1800	.....	165
..	3000	\$2250	.....	168
..	3000	\$2150	.....	168
..	5000	\$2250	.....	174
..	5000	\$2350	.....	174

Hoadley Bros., Gosport, Ind.				
Model	Cap.	Chas. Price	Comp.	Page
..	4000	\$3000	.....	171

Indiana Truck Co., Marion, Ind.				
Model	Cap.	Chas. Price	Comp.	Page
S	2000	\$1385	.....	165
D	4000	\$2000	.....	171
R	6000	\$2750	.....	175
L	10,000	\$3500	.....	178

International Harvester Corp., Akron, O.				
Model	Cap.	Chas. Price	Comp.	Page
M A	1000	\$600	.....	162
M W	1000	\$710	.....	162
E	1500	\$950	.....	164
F	2000	\$1500	.....	165

International Motor Co., New York, N. Y.				
Model	Cap.	Chas. Price	Comp.	Page
A B	2000	\$2000	.....	166
A B	3000	\$2350	.....	168
A B	4000	\$2700	.....	171
A C	7000	\$3400	.....	177
..	10,000	\$4800	.....	179
A C	11,000	\$4000	.....	180
..	13,000	\$5800	.....	180
A C	15,000	\$4500	.....	180
A C	30,000	\$4000	.....	181

Independent Mot. Corp., Port Huron, Mich.				
Model	Cap.	Chas. Price	Comp.	Page
F	2000	\$1285	.....	165
G	4000	\$1850	.....	171

Thomas B. Jeffery Co., Kenosha, Wis.				
Model	Cap.	Chas. Price	Comp.	Page
1016	1500	\$900	.....	164
2016	3000	\$1400	.....	168
4015	4000	\$2750	.....	171
4016	4000	\$2850	.....	171

Kearna Motor Truck Co., Beavertown, Pa.				
Model	Cap.	Chas. Price	Comp.	Page
D	1000	.....	.....	162

Kelly Springfield M. T. Co., Springfield, O.				
Model	Cap.	Chas. Price	Comp.	Page
K 31	3000	\$2050	.....	168
K 32	3000	.....	.....	181
K 35	5000	\$2750	.....	174
K 36	5000	.....	.....	181
K 40	7000	\$3400	.....	176
K 45	8000	\$3600	.....	177
K 50	10,000	\$4250	.....	178
K 60	12,000	\$4500	.....	180

A. R. King Mfg. Co., Kingston, N. Y.				
Model	Cap.	Chas. Price	Comp.	Page
..	7000	\$1600	.....	176

## Kissel Motor Car Co., Hartford, Wis.

Model	Cap.	Chas. Price	Comp.	Page
..	1000	\$950	.....	162
..	2000	\$1500	.....	165
..	4000	\$2100	.....	171
..	6000	\$2750	.....	175
..	8000	\$3350	.....	177
..	12,000	\$4350	.....	180

Kleiber Motor Car Co., San Francisco, Ca.				
Model	Cap.	Chas. Price	Comp.	Page
A	3000	\$2250	.....	168
B	5000	\$2750	.....	174
C	7000	\$3500	.....	176
D	10,000	\$4500	.....	178

Knickerbocker M. Tk. Co., New York City.				
Model	Cap.	Chas. Price	Comp.	Page
16	7000	\$2850	.....	176
16	10,000	\$4000	.....	179

Knox Motors Associates, Springfield, Mass.				
Model	Cap.	Chas. Price	Comp.	Page
35	.....	\$4500	.....	181

H. J. Koehler S. G. Co., Newark, N. J.				
Model	Cap.	Chas. Price	Comp.	Page
K	2000	\$940	\$955	165

Kosmuth Company, Detroit, Mich.				
Model	Cap.	Chas. Price	Comp.	Page
15	1000	\$675	.....	162

Krebs Commercial Car Co., Clyde, O.				
Model	Cap.	Chas. Price	Comp.	Page
F	1500	\$1600	.....	164
G	2000	\$2000	.....	166
H	4000	\$2450	.....	171
I	7000	\$3250	.....	181

Wm. Landshaft & Son, Chicago, Ill.				
Model	Cap.	Chas. Price	Comp.	Page
G 1	2000	\$1250	.....	166
J 1	4000	\$1550	.....	171

Lange Motor Truck Co., Pittsburg, Pa.				
Model	Cap.	Chas. Price	Comp.	Page
C	2000	\$1850	.....	166
B	4000	\$2450	.....	171

Larrabee Deyo M. T. Co., Hinghamton, N. Y.				
Model	Cap.	Chas. Price	Comp.	Page
A	3000	\$2000	.....	168
B	3000	\$2000	.....	168
D	5000	\$2300	.....	174
C	5000	\$2300	.....	174
E	5000	\$2300	.....	174

Lawson Mfg. Co., Pittsburg, Pa.				
Model	Cap.	Chas. Price	Comp.	Page
35	1000	.....	.....	162
..	1500	.....	.....	164

Leachna Automobile Co., Newark, N. J.				
Model	Cap.	Chas. Price	Comp.	Page
W	1000	.....	.....	163

Lewis-Hall Iron Works, Detroit, Mich.				
Model	Cap.	Chas. Price	Comp.	Page
2 worm	4000	\$2000	.....	171
3½ worm	7000	\$2800	.....	176
3½ chain	7000	\$2800	.....	176
5 chain	10,000	\$3400	.....	178

Lincoln Motor Truck Co., Detroit, Mich.				
Model	Cap.	Chas. Price	Comp.	Page
D	1500	\$900	.....	164

Lippard Stewart M. C. Co., Buffalo, N. Y.				
Model	Cap.	Chas. Price	Comp.	Page
M	1000	\$1000	.....	163
W	1500	\$1600	.....	164
H	2000	\$2000	.....	166
F	3000	\$2300	.....	168
G	4000	\$2600	.....	171

Locomobile Co. of Am., Bridgeport, Conn.				
Model	Cap.	Chas. Price	Comp.	Page
B	6000	\$3500	.....	175
B B	8000	\$3650	.....	178

Lombard Auto Trac. Tk. Co., New York.				
Model	Cap.	Chas. Price	Comp.	Page
..	2000	.....	.....	166
100	10,000	.....	\$6000	179

Maccar Company, Seranton, Pa.				
Model	Cap.	Chas. Price	Comp.	Page
K	2000	\$2100	.....	166
L	2000	\$2100	.....	166
J	4000	\$2600	.....	171
H	4000	\$2600	.....	171
O	7000	\$3250	.....	177
M	7000	\$3250	.....	177

Mals Motor Truck Co., Indianapolis, Ind.				
Model	Cap.	Chas. Price	Comp.	Page
C D	3000	\$2600	.....	168
E F	4000	\$2800	.....	171
K L H	6000	\$3300	.....	175
M	8000	\$3750	.....	178

Mansur Motor Tk. Co., Haverhill, Mass.				
Model	Cap.	Chas. Price	Comp.	Page
..	4000	\$2000	.....	172

The Martin Carriage Works, York, Pa.				
Model	Cap.	Chas. Price	Comp.	Page
16	1000	\$660	.....	162

Mercury Mfg. Co., Chicago, Ill.				
Model	Cap.	Chas. Price	Comp.	Page
..	.....	\$3400	.....	181
A	.....	\$3400	.....	181
P	1000	\$650	.....	162

## Mogul Motor Truck Co., St. Louis, Mo.

Model	Cap.	Chas. Price	Comp.	Page
LM	3000	\$1600	.....	168
L W	4000	\$2000	.....	172
L	5000	\$2250	.....	174
T	7000	\$2550	.....	177

J. W. Moon Buggy Co., St. Louis, Mo.				
Model	Cap.	Chas. Price	Comp.	Page
B	3000	\$1650	.....	168

Moreland Motor Tk. Co., Los Angeles, Cal.				
Model	Cap.	Chas. Price	Comp.	Page
..	2000	\$1550	.....	166
..	3000	\$1850	.....	168
..	5000	\$2400	.....	174
..	8000	\$3400	.....	178

Morton Truck & Tr. Co., Harrisburg, Pa.				
Model	Cap.	Chas. Price	Comp.	Page
..	6000	.....	.....	175

Myers Machine Co., Sheboygan, Wis.				
Model	Cap.	Chas. Price	Comp.	Page
A	2000	\$1650	.....	167
B	6000	\$2275	.....	175



000 ..... \$3950 184  
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# AMERICAN MANUFACTURERS OF 1916 GASOLINE WAGONS, TRUCKS AND TRACTORS.

The Specifications of the Vehicles in Bold Face Type Are Included in This Issue.

<b>A. &amp; B.</b> .....	American and British Manufacturing Co.,	Providence, R. I.
<b>A. &amp; R.</b> .....	Abendroth & Root Manfg. Co.,	Newburgh, N. Y.
<b>Aeana</b> .....	Aeson Motor Truck Co.,	Detroit, Mich.
<b>Aemo</b> .....	Cadillac Auto Truck Co.,	Cadillac, Mich.
<b>Adams</b> .....	Adams Truck, Foundry and Machine Co.,	Flint, Mich.
<b>Alamo</b> .....	Alamo Manufacturing Co.,	Hillsdale, Mich.
<b>Alis-Chalmers</b> .....	Alis-Chalmers Manufacturing Co.,	Milwaukee, Wis.
<b>Argo</b> .....	Argo Motor Co.,	Jackson, Mich.
<b>Armleder</b> .....	O. Armleder Co.,	Cincinnati, O.
<b>Atlas</b> .....	Martin Carriage Works,	York, Pa.
<b>Atlas-Detroit</b> .....	Atlas-Detroit Motor Car Co.,	Buffalo, N. Y.
<b>Atterbury</b> .....	Atterbury Motor Car Co.,	Buffalo, N. Y.
<b>Augalze</b> .....	Augalze Motor Car Co.,	New Bremen, O.
<b>Autocar</b> .....	Autocar Co.,	Ardmore, Pa.
<b>Auto Truck</b> .....	Auto Truck Co.,	Bangor, Pa.
<b>Available</b> .....	Available Truck Co.,	Chicago, Ill.
<b>Avery</b> .....	Avery Co.,	Peoria, Ill.
<b>Barker</b> .....	C. L. Barker,	Norwalk, Conn.
<b>Bauer</b> .....	Bauer Machine Works Co.,	Kansas City, Mo.
<b>Beech Creek</b> .....	Beech Creek Truck and Auto Co.,	Beech Creek, Pa.
<b>Bell</b> .....	Bell Motor Car Co.,	York, Pa.
<b>Bessemer</b> .....	Bessemer Motor Truck Co.,	Grove City, Pa.
<b>Blmel</b> .....	Blmel Buggy Co.,	Slidney, O.
<b>Blair</b> .....	Blair Motor Truck Co.,	Newark, O.
<b>Board</b> .....	B. F. Board Motor Truck Co.,	Alexandria, Va.
<b>Bollstrom</b> .....	Bollstrom Products Sales Co.,	Little Creek, Mich.
<b>Brennan</b> .....	Brennan Manufacturing Co.,	Syracuse, N. Y.
<b>Bristol</b> .....	Chester County Motor Co.,	Coatesville, Pa.
<b>Briscoe</b> .....	Briscoe Motor Co.,	Jackson, Mich.
<b>Brockway</b> .....	Brockway Motor Wagon Co.,	Cortland, N. Y.
<b>Bucklen</b> .....	H. E. Bucklen, Jr., Motor Truck Co.,	Elkhart, Ind.
<b>Bulck</b> .....	Bulck Motor Co.,	Flint, Mich.
<b>Burford</b> .....	H. G. Burford Co.,	Fremont, O.
<b>Carlton</b> .....	Carlton Hill Motor Car Co.,	Rutherford, N. J.
<b>Carroll</b> .....	Carroll Motor Car Co.,	Strassburg, Pa.
<b>Casey</b> .....	F. A. Casey,	Hillieria, Mass.
<b>Chadwick</b> .....	Chadwick Engineering Works,	Pottstown, Pa.
<b>Chase</b> .....	Chase Motor Truck Co.,	Syracuse, N. Y.
<b>Clyde</b> .....	Clyde Motor Truck Co.,	Long Island City, N. Y.
<b>Coleman</b> .....	Coleman Carriage and Harness Co.,	Illion, N. Y.
<b>Columbia</b> .....	Columbia Motor Truck and Trailer Co.,	Pontiac, Mich.
<b>Commerce</b> .....	Commerce Motor Car Co.,	Detroit, Mich.
<b>C. T.</b> .....	Commercial Truck Co. of America,	Philadelphia, Pa.
<b>Concord</b> .....	Abbott & Bowling Co.,	Concord, N. H.
<b>Continental (C)</b> .....	Continental Motor Truck Co.,	Chicago, Ill.
<b>Continental (S)</b> .....	Continental Truck Manufacturing Co.,	Superior, Wis.
<b>Corbitt</b> .....	Corbitt Automobile Co.,	Henderson, N. C.
<b>Couple-Gear</b> .....	Couple-Gear Freight Wheel Co.,	Grand Rapids, Mich.
<b>Crawford</b> .....	Crawford Automobile Co.,	Hagerstown, Md.
<b>Croce</b> .....	Croce Automobile Co.,	Asbury Park, N. J.
<b>Crowther</b> .....	Crowther Motor Co.,	Philadelphia, Pa.
<b>Crown</b> .....	Crown Commercial Car Co.,	North Milwaukee, Wis.
<b>Curtis</b> .....	Pittsburg Machine Tool Co.,	Bradock, Pa.
<b>Dain</b> .....	Dain Manufacturing Co.,	Ottumwa, Ia.
<b>Dart</b> .....	Dart Motor Truck Co.,	Waterloo, Ia.
<b>Day-Elder</b> .....	Day-Elder Motors Co.,	Newark, N. J.
<b>Dayton</b> .....	Durable Dayton Truck Co.,	Dayton, O.
<b>DeKalb</b> .....	DeKalb Wagon Co.,	DeKalb, Ill.
<b>Denby</b> .....	Denby Motor Truck Co.,	Detroit, Mich.
<b>Detroit</b> .....	Detroit Commercial Car Co.,	Pontiac, Mich.
<b>Diamond T</b> .....	Diamond-T Motor Car Co.,	Chicago, Ill.
<b>Dispatch</b> .....	Dispatch Motor Car Co.,	Minneapolis, Minn.
<b>Donac</b> .....	Donac Motor Truck Co.,	San Francisco, Cal.
<b>Domolin</b> .....	Domolin Motor Truck Co.,	Detroit, Mich.
<b>Dorrila</b> .....	Dorrila Motor Car Co.,	St. Louis, Mo.
<b>Duffy</b> .....	Duffy Bros. Motor Truck Co.,	San Francisco, Cal.
<b>Kopp</b> .....	Kopp Motor Truck Co.,	Buffalo, N. Y.
<b>Kosmath</b> .....	Kosmath Co.,	Detroit, Mich.
<b>Krebs</b> .....	Krebs Commercial Car Co.,	Clyde, O.
<b>Lambert</b> .....	Ruckeye Manufacturing Co.,	Anderson, Ind.
<b>Landshaft</b> .....	William Landshaft & Sons,	Chicago, Ill.
<b>Lane</b> .....	Lane Motor Truck Co.,	Kalamazoo, Mich.
<b>Lange</b> .....	Lange Motor Truck Co.,	Pittsburg, Pa.
<b>Lawson</b> .....	Lawson Manufacturing Co.,	Pittsburg, Pa.
<b>Larabee</b> .....	Larabee-Deyo Motor Truck Co.,	Binghamton, N. Y.
<b>Lenox</b> .....	Lenox Motor Car Co.,	Roston, Mass.
<b>Lescina</b> .....	Lescina Automobile Co.,	Newark, N. J.
<b>Lima</b> .....	Lima Light Car Manufacturing Co.,	Lima, O.
<b>Lippard-Stewart</b> .....	Lippard-Stewart Motor Car Co.,	Buffalo, N. Y.
<b>Little Giant</b> .....	Chicago Pneumatic Tool Co.,	Chicago, Ill.
<b>Lincoln</b> .....	Lincoln Motor Truck Co.,	Detroit, Mich.
<b>Lombard</b> .....	Lombard Auto-Truck Corp.,	New York, N. Y.
<b>Lord Baltimore</b> .....	Lord Baltimore Motor Truck Co.,	Baltimore, Md.
<b>Maccar</b> .....	Maccar Co.,	Scranton, Pa.
<b>Mac</b> .....	International Motor Co.,	New York, N. Y.
<b>Malis</b> .....	Premier Motors Corporation,	Indianapolis, Ind.
<b>Maxwell</b> .....	Maxwell Motor Co.,	Detroit, Mich.
<b>McNulty</b> .....	D. F. Poyer Co.,	Menominee, Mich.
<b>Mercury</b> .....	Mercury Manufacturing Co.,	Chicago, Ill.
<b>Mercury-Bully Tractor</b> .....	Mercury Manufacturing Co.,	Chicago, Ill.
<b>Metz</b> .....	Metz Company,	Waltham, Mass.
<b>Miscampbell</b> .....	Hugh Miscampbell,	Duluth, Minn.
<b>Modern</b> .....	Howling Green Motor Co.,	Bowling Green, O.
<b>Mogul</b> .....	Mogul Motor Truck Co.,	St. Louis, Mo.
<b>Mohawk</b> .....	Mohawk Motor Truck Co.,	Ravenna, O.
<b>Monitor</b> .....	Monitor Automobile Works	Janesville, Wis.
<b>Moore</b> .....	Jos. W. Moon Buggy Co.,	St. Louis, Mo.
<b>Moore</b> .....	Pacific Products Co.,	Torrence, Cal.
<b>Moreland</b> .....	Moreland Motor Truck Co.,	Los Angeles, Cal.
<b>Morse</b> .....	Morse Cyclecar Co.,	Pittsburg, Pa.
<b>Morton</b> .....	Morton Truck and Tractor Co.,	Harrisburg, Pa.
<b>Natro</b> .....	National Motor Truck Co.,	Bay City, Mich.
<b>National</b> .....	National United Service Co.,	New York, N. Y.
<b>Nelson &amp; LeMoon</b> .....	Nelson & LeMoon,	Chicago, Ill.
<b>Neto</b> .....	New England Truck Co.,	Pittsburg, Mass.
<b>Nevada</b> .....	Nevada Manufacturing Co.,	Nevada, Ia.
<b>New London</b> .....	New London Motor Truck Co.,	New London, Conn.
<b>New York</b> .....	Tegetmeyer & Reipe,	New York, N. Y.
<b>Niles</b> .....	Niles Car and Manufacturing Co.,	Niles, O.
<b>Old Hickory</b> .....	Kentucky Wagon Manufacturing Co.,	Louisville, Ky.
<b>Old Reliable</b> .....	Old Reliable Motor Truck Co.,	Chicago, Ill.
<b>Overland</b> .....	Willis-Overland Co.,	Toledo, O.
<b>Packard</b> .....	Packard Motor Car Co.,	Detroit, Mich.
<b>Packer</b> .....	Packet M. C. Manufacturing Co.,	Minneapolis, Minn.
<b>Palmer</b> .....	Palmer-Meyer Motor Car Co.,	St. Louis, Mo.
<b>Palmer-Moore</b> .....	Palmer-Moore Co.,	Syracuse, N. Y.
<b>Paulding</b> .....	St. Louis Motor Truck Co.,	St. Louis, Mo.
<b>Peerless</b> .....	Peerless Motor Truck and Corporation,	Cleveland, O.
<b>Phoenix Centipede</b> .....	Phoenix Manufacturing Co.,	Eau Claire, Wis.
<b>Pierce-Arrow</b> .....	Pierce-Arrow Motor Car Co.,	Buffalo, N. Y.
<b>Piercy</b> .....	Hub Motor Truck Co.,	Columbus, O.
<b>Piggins</b> .....	Piggins Bros. Motor Truck Co.,	Racine, Wis.
<b>Reo</b> .....	Reo Motor Truck Co.,	Lansing, Mich.
<b>Republic</b> .....	Republic Motor Truck Co.,	Ann Arbor, Mich.
<b>Riker</b> .....	Locomotive Company of America,	Bridgeport, Conn.
<b>Robinson</b> .....	Golden West Motors Co.,	Sacramento, Cal.
<b>Rockford</b> .....	Rockford Motor Truck Co.,	Rockford, Ill.
<b>Roto</b> .....	Roto Motor Co.,	Hannibal, Mo.

<b>Duplex</b> .....	Duplex-Power Car Co.,	Charlotte, Mich.	<b>Howe</b> .....	Rowe Motor Co.,	Towningtown, Pa.
<b>Durocar</b> .....	Amalgamated Motors Corp.,	Alhambra, Cal.	<b>Itzal</b> .....	Royal Motor Truck Co.,	New York, N. Y.
<b>Duryea</b> .....	Duryea Laboratories,	Philadelphia, Pa.	<b>It-S</b> .....	Reading-Standard Co.,	Reading, Pa.
			<b>Itush</b> .....	Rush Delivery Car Co.,	Philadelphia, Pa.
<b>Eastern</b> .....	Eastern Power Truck Co.,	Providence, R. I.	<b>Salvador</b> .....	Mansur Motor Truck Co.,	Haverhill, Mass.
<b>Eclipse</b> .....	Eclipse Motor Co.,	Tiffin, O.	<b>Sandow</b> .....	Sandow Truck Co.,	Chicago, Ill.
<b>Economy</b> .....	Economy Motor Co.,	Tiffin, O.	<b>Sandow</b> .....	Sandow Motor Truck Co.,	Syracuse, N. Y.
<b>Elbert</b> .....	Elbert Motor Car Co.,	Tacoma, N. Wash.	<b>Saurer</b> .....	International Motor Co.,	New York, N. Y.
<b>Elmira</b> .....	Elmira Commercial Car Co.,	Elmira, N. Y.	<b>Saxon</b> .....	Saxon Motor Co.,	Detroit, Mich.
<b>Erle</b> .....	Erle Motor Truck Manufacturing Co.,	Erle, Pa.	<b>Schleicher</b> .....	Schleicher Motor Vehicle Co.,	New York, N. Y.
			<b>Selden</b> .....	Selden Motor Vehicle Co.,	New York, N. Y.
<b>Falcon</b> .....	Falcon Motor Truck Co.,	Detroit, Mich.	<b>Service</b> .....	Service Motor Truck Co.,	Rochester, N. Y.
<b>Fargo</b> .....	Fargo Motor Car Co.,	Chicago, Ill.	<b>Sheridan</b> .....	Sheridan Commercial Car Co.,	Wabash, Ind.
<b>Fawcok</b> .....	Fawcok Motor Car Co.,	Stout Falls, S. D.	<b>Siebert</b> .....	Siebert Motor Truck Co.,	Harvey, Ill.
<b>Federal</b> .....	Federal Motor Truck Co.,	Detroit, Mich.	<b>Signal</b> .....	Signal Motor Truck Co.,	Toledo, O.
<b>Forscher</b> .....	Philip Forscher Wagon Co.,	New Orleans, La.	<b>Signal</b> .....	Signal Motor Truck Co.,	Detroit, Mich.
<b>Fostoria</b> .....	Fostoria Light Car Co.,	Fostoria, O.	<b>South Bend</b> .....	South Bend Motor Car Works	South Bend, Ind.
<b>Four-Drive</b> .....	Four-Drive Tractor Co.,	Big Rapids, Mich.	<b>Standard</b> .....	Standard Motor Truck Co.,	Detroit, Mich.
<b>Franklin</b> .....	Franklin Commercial Truck Co.,	Franklin, Pa.	<b>Standard Tractor</b> .....	Standard Tractor Co.,	Brooklyn, N. Y.
<b>Frome</b> .....	R. L. Frome Manufacturing Co.,	Sheboygan, Wis.	<b>Stearns</b> .....	F. B. Stearns Co.,	Cleveland, O.
<b>F. W. D.</b> .....	Four Wheel Drive Auto Co.,	Clintonville, Wis.	<b>Steele</b> .....	W. M. Steele,	Worcester, Mass.
			<b>Stegeman</b> .....	Stegeman Motor Car Co.,	Milwaukee, Wis.
<b>Gabriel</b> .....	Gabriel Auto Co.,	Cleveland, O.	<b>Sterling</b> .....	Sterling Motor Truck Co.,	Milwaukee, Wis.
<b>Garford</b> .....	Garford Motor Truck Co.,	Lima, O.	<b>Stewart (H)</b> .....	Stewart Motor Corporation,	Buffalo, N. Y.
<b>Gary</b> .....	Gary Motor Truck Co.,	Gary, Ind.	<b>Stewart (H)</b> .....	Stewart Iron Works,	Covington, Ky.
<b>G. A. Schacht</b> .....	G. A. Schacht Motor Truck Co.,	Cincinnati, O.	<b>Studebaker</b> .....	Studebaker Corporation,	Detroit, Mich.
<b>Gay</b> .....	S. G. Gay Co.,	Ottawa, Ill.	<b>Sullivan</b> .....	Sullivan Motor Truck Co.,	Rochester, N. Y.
<b>Geneva</b> .....	Geneva Wagon Co.,	Geneva, N. Y.	<b>Superior</b> .....	E. G. Willingham's Sons,	Atlanta, Ga.
<b>Gersix</b> .....	Gerling Motor Car Co.,	Portland, Ore.			
<b>Globe</b> .....	Globe Motor Truck Co.,	Northville, Mich.	<b>Tiffin</b> .....	Tiffin Wagon Co.,	Tiffin, O.
<b>G-M-C</b> .....	General Motors Truck Co.,	Pontiac, Mich.	<b>Toepfner</b> .....	Toepfner Bros.,	Bay City, Mich.
<b>Gramm-Bernstein</b> .....	Gramm-Bernstein Co.,	Lima, O.	<b>Toledo</b> .....	Toledo Motor Truck Co.,	Toledo, O.
<b>Great Southern</b> .....	Great Southern Automobile Co.,	Birmingham, Ala.	<b>Tower</b> .....	Tower Motor Truck Co.,	Greenville, Mich.
<b>G-V-Mercedes</b> .....	General Vehicle Co.,	Long Island City, N. Y.	<b>Trabold</b> .....	Trabold Motor Manufacturing Co.,	Johnstown, Pa.
			<b>Transit</b> .....	Transit Motor Car Co.,	Louisville, Ky.
<b>Hahn</b> .....	Hahn Motor Truck Co.,	Hamburg, Pa.	<b>Transport Tractor</b> .....	Transport Tractor Co.,	Long Island City, N. Y.
<b>Hall</b> .....	Lewis-Hall Iron Works,	Detroit, Mich.	<b>Trumbull</b> .....	Trumbull Motor Car Co.,	Bridgeport, Conn.
<b>Handy Wagon</b> .....	Auburn Motor Chassis Co.,	Auburn, Ind.	<b>Tulsa</b> .....	Tulsa Automobile & Manufacturing Co.,	Tulsa, Okla.
<b>Hanger</b> .....	C. F. Hanger Co.,	Cleveland, O.	<b>Twin City</b> .....	Packet Motor Car Manufacturing Co.,	Minneapolis, Minn.
<b>Hannibal</b> .....	Hannibal Motor Car Co.,	Hannibal, Mo.			
<b>Harrison</b> .....	Robert Harrison Co.,	South Boston, Mass.	<b>United</b> .....	United Motor Truck Co.,	Grand Rapids, Mich.
<b>Harvey</b> .....	Harvey Motor Truck Co.,	Harvey, Ill.	<b>United States</b> .....	United States Motor Truck Co.,	Cincinnati, O.
<b>Hascall</b> .....	Hascall Motor Truck Co.,	Palmsville, O.	<b>Universal</b> .....	Universal Service Co.,	Detroit, Mich.
<b>Hastfield</b> .....	Hastfield Cart and Carriage Co.,	Cortland, O.			
<b>Haughton</b> .....	Haughton Sulky Co.,	Marion, O.	<b>Van Winkle</b> .....	Van Winkle Motor Truck Co.,	Atlanta, Ga.
<b>Henderson</b> .....	Henderson Bros.,	North Cambridge, Mass.	<b>Velle</b> .....	Velle Motor Vehicle Co.,	Moline, Ill.
<b>Hercules (S. B.)</b> .....	Hercules Motor Truck Co.,	South Boston, Mass.	<b>Viall</b> .....	Viall Motor Car Co.,	Chicago, Ill.
<b>Hercules (C)</b> .....	Hercules Motor Manufacturing Co.,	Canton, O.	<b>Vim</b> .....	Vim Motor Truck Co.,	Philadelphia, Pa.
<b>Hewitt-Ludlow</b> .....	Hewitt-Ludlow Auto Co.,	San Francisco, Cal.	<b>Voltz</b> .....	Voltz Bros.,	Chicago, Ill.
<b>Hoadley</b> .....	Hoadley Bros.,	Gosport, Ind.			
<b>Howard</b> .....	Detroit-Wyandotte Motor Co.,	Wyandotte, Mich.	<b>Walter</b> .....	Walter Motor Truck Co.,	New York, N. Y.
<b>Howard</b> .....	Howard Motor Truck Co.,	Boston, Mass.	<b>Ware</b> .....	Twin City Four Wheel Drive Co.,	St. Paul, Minn.
<b>Hurlburt</b> .....	Hurlburt Motor Truck Co.,	New York, N. Y.	<b>Warren</b> .....	Warren Motor Truck Co.,	Warren, O.
			<b>Washington</b> .....	Washington Motor Car Co.,	Hyattsville, Md.
<b>I-H-C</b> .....	International Harvester Co.,	Akron, O.	<b>Watson</b> .....	Watson Wagon Co.,	Canastota, N. Y.
<b>Independent</b> .....	Independent Motors Corp.,	Port Huron, Mich.	<b>Weller-Smith</b> .....	Weller-Smith Truck Co.,	Birmingham, Mich.
<b>Indiana</b> .....	Indiana Motor Truck Co.,	Marion, Ind.	<b>West Coast</b> .....	West Coast Truck Co.,	Tacoma, Wash.
<b>Iowa</b> .....	Iowa Motor Truck Co.,	Ottumwa, Ia.	<b>White</b> .....	White Motor Co.,	Cleveland, O.
			<b>Wichita</b> .....	Wichita Falls Motor Co.,	Wichita Falls, Tex.
<b>Jeffery</b> .....	Thomas B. Jeffery Co.,	Racine, Wis.	<b>Wilson</b> .....	J. C. Wilson Co.,	Minneapolis, Minn.
			<b>Wisconsin</b> .....	Myers Machine Co.,	Detroit, Mich.
<b>Kanawha</b> .....	Kanawha Auto Truck Co.,	Charleston, W. Va.	<b>Witt-Will</b> .....	Witt-Will Co.,	Sheboygan, Wis.
<b>Kearns</b> .....	Kearns Motor Car Co.,	Beavertown, Pa.	<b>Wolverine</b> .....	Wolverine-Detroit Motor Co.,	Washington, D. C.
<b>Kelly-Springfield</b> .....	Kelly-Springfield Motor Truck Co.,	Springfield, O.	<b>Woods</b> .....	Woods Mobilette Co.,	Detroit, Mich.
<b>King</b> .....	A. B. King Manufacturing Co.,	Kingsston, N. Y.			Chicago, Ill.
<b>Kissel</b> .....	Kissel Motor Car Co.,	Hartford, Wis.	<b>Zettler &amp; Lamson</b> .....	Zettler & Lamson Motor Truck Co.,	Chicago, Ill.
<b>Kleber</b> .....	Kleber Co., Inc.,	San Francisco, Cal.	<b>Zimmerman</b> .....	Zimmerman Manufacturing Co.,	Auburn, Ind.
<b>Kneckerbocker</b> .....	Kneckerbocker Motor Truck Co.,	New York, N. Y.			
<b>Knox</b> .....	Knox Motors Associates,	Springfield, Mass.			
<b>Koehler</b> .....	H. J. Koehler S. G. Co.,	Newark, N. J.			
<b>Koenig &amp; Luhrs</b> .....	Koenig & Luhrs Wagon Co.,	Quincy, Ill.			

## Manufacturers of Electric Trucks.

Argo .....	American Electric Car Co.,	Saginaw, Mich.
Andover .....	Andover Motor Vehicle Co.,	Andover, Mass.
Atlantic .....	Atlantic Electric Vehicle Co.,	Newark, N. J.
Baker .....	Baker-R. & L. Co.,	Cleveland, O.
Beaver .....	Beaver State Motor Co.,	Gresham, Ore.
Buffalo .....	Buffalo Electric Vehicle Co.,	Buffalo, N. Y.
Capitol .....	Capitol Truck Manufacturing Co.,	Denver, Col.
Carl .....	Carl Electric Vehicle Co.,	Toledo, O.
Connorsville .....	Connorsville Buggy Co.,	Connorsville, Ind.
Couple-Gear .....	Couple-Gear Freight Wheel Co.,	Grand Rapids, Mich.
C. T. ....	Commercial Truck Company of America	Philadelphia, Pa.
Dayton .....	Dayton Electric Car Co.,	Dayton, O.
Eagle .....	Eagle Electric Automobile Co.,	Detroit, Mich.
Field .....	Field Omnibus Co.,	New York, N. Y.
Fritchle .....	Fritchle Automobile and Battery Co.,	Denver, Col.
G-M-C .....	General Motors Truck Co.,	Pontiac, Mich.
G-V .....	General Vehicle Co.,	Long Island City, N. Y.
Lansden .....	Lansden Co., Ltd.,	Brooklyn, N. Y.
Los Angeles .....	Los Angeles Cream, Auto & Mch. Wks.,	Los Angeles, Cal.
Milburn .....	Milburn Wagon Co.,	Toledo, O.
Storms .....	Storms Electric Co.,	Detroit, Mich.
Urban .....	Kentucky Wagon Manufacturing Co.,	Louisville, Ky.
Voltacar .....	Cyco-Lectric Car Co.,	New York, N. Y.
Walker .....	Walker Vehicle Co.,	Chicago, Ill.
Ward .....	Ward Motor Vehicle Co.,	Mount Vernon, N. Y.
Waverley .....	Waverley Co.,	Indianapolis, Ind.

### GOODYEAR REPAIR MANUAL.

To aid the repair man and vulcanizer the Goodyear Tire and Rubber Company, Akron, O., has issued a manual of tire repairing which contains, in addition to a complete catalogue of the repair materials made by the company, chapters of instruction in better methods of tire restoration. These include handling and keeping stock, making cement, doing the repair work and accounting, by which the repair man can know whether or not he is making money and, if so, just how he is making it. It is a very useful book for the man in the business and it can be had on request by addressing the Akron office of the company.

### NEW M. & A. M. MEMBERS.

A meeting of the board of directors of the Motor and Accessory Manufacturers was held in the association's offices in New York City, April 14, at which the following firms were admitted to membership in the organization: Detroit Gear and Machine Company, maker of transmissions, clutches and transmission gears at 127 Franklin street, Detroit, and the G. Piel Company, maker of Long horns and muffler cutouts, 13th street and Boulevard, Long Island City, New York. The product of the Piel company is marketed by the Edward A. Cassidy Company, Inc., 30 East 42nd street, New York City.

### PUTS SAVINGS INTO TIRES.

The Goodyear Tire & Rubber company's business increased 235 per cent. during the first three months of this year over the corresponding period for last year. This has reduced the production cost by decreasing proportionate factory over-

head and distributing expense. As has been the practise of the company in the past, a large part of this saving has been put back into the tires in improvements. Extra quality built into the tires will cost the company \$4,000,000 this year its officers declare. Recently a way was discovered to strengthen the side walls so that side wall breaks are less likely. It was adopted at a cost on the year's output of \$500,000. While the production has been increasing steadily, the company's purpose has been to improve the quality of the tires with equal rapidity.

### NEW SOUTHERN TIRE PLANT.

The J & D Tire Company has been organized and is rapidly erecting a plant at Charlotte, N. C., to make pneumatic tires for motor cars. The president is Harold O. Smith, formerly of Indianapolis, Ind., the founder and operator of the G & J Tire Company business until it was taken over by the United States Tire Company. Since 1906 Mr. Smith has been connected with the Premier Motor Car Company. Charlotte is an excellent centre for the kind of labor that will be required and has other advantages. The plant is financed in part by southern capitalists. The company has capital of \$500,000 and will make one grade of tires, which will be made in all standard sizes. Production will be started in July, as machinery was purchased last October. Other officials of the company are Thomas J. Northway, Rochester, N. Y., vice president; L. A. Falger, Charlotte, N. C., secretary; C. A. Coddington, Charlotte, treasurer. Among the directors are Harry S. Leyman of Cincinnati, O., D. H. McCollough and E. Thomson.

### BOCK COMPANY REORGANIZED.

A new company has been capitalized at \$1,650,000 to take over the plant and business of the Bock Taper Roller Bearing Company of Toledo, O. William E. Bock is president, Eugene Rheinfrank vice president and C. H. Clement is secretary and treasurer. M. H. Murch of Cleveland and J. E. Dunipace of Toledo comprise, with the officers, the directorate. Of the stock \$1,200,000 will be common and \$450,000 seven per cent. preferred. The capital of the old company was \$212,000 common and \$150,000 preferred. Holders of the old common stock will receive share for share in the new company and holders of the old preferred two shares of the new common for each share of old preferred. The plant will be tripled in capacity. Work will be begun immediately. The present output of bearings is 1200 per day. With the new facilities the company plans an output of 3000 bearings a day. At present 200 men are employed.

### DENBY NEW ENGLAND BRANCH.

The Denby Motor Truck Company of Detroit, Mich., has established a factory branch at Boston, Mass., known as the Denby New England Sales Company, which is directed by W. Ward Mahoun, the company's representative in New York. Denby trucks have been sold for some time in Connecticut and Rhode Island through the New York branch, but have not been directly distributed in Boston. Arrangements have been made with J. D. McIntire of 20 Green street, Cambridge, to furnish service to Denby buyers in the Greater Boston territory. With the ¾-ton truck 100 service coupons, entitling the owner to 100 half hours of service on his truck, will be given, and on the larger sizes 150 coupons. This applies to all work, no matter to whose fault the trouble is due. The company makes a sales point of the fact that it is doing its own sales work and has no commissions to pay to dealers.

### EISEMANN SERVICE STATION.

The New York service station of the Eisemann Magneto Company was discontinued April 8 and the Auto Electric Service Company took over the stock of machines and equipment. The station will be maintained at the same address and will take care of owners throughout the metropolitan district, including Long Island City, the Bronx, Westchester and Rockland counties in New York and Bergen, Hudson, Essex and Union counties in New Jersey.

The company will be operated by Henry Berlinghof, formerly service manager of the Eisemann Magneto Company, and George Strasser, formerly foreman of the Eisemann repair department. William B. Clowes succeeded Mr. Berlinghof as service manager at the Brooklyn plant of the company.

**ELECTRIC VEHICLE CONVENTION.**

The Electric Vehicle Association has merged with the National Electric Light Association, becoming the Electric Vehicle Section of that body, and its annual convention will be held May 22 to 26 at Chicago, when the larger body meets.

The National Electric Light Association represents 6000 central stations in all parts of the United States and will add great force to the campaign to introduce electric trucks and vehicles.

The following papers will be delivered before the meetings of the Electric Vehicle men:

"Central Station Assistance in Promoting Electric Vehicle Use," by W. P. Kennedy, consulting engineer; "Exchange Battery Systems," P. D. Wagoner, president General Vehicle Company; "Passenger Vehicle Problems and Activities," E. P. Chalfant, Anderson Electric Car Company; "The Relation of Tires to Electric Vehicle Efficiency," S. V. Norton, Goodrich Rubber Company; "Electric Truck Troubles and How to Minimize Them," F. E. Whitney, Commercial Truck Company of America; "Industrial Truck Applications," C. W. Squires, Jr., of the General Vehicle Company.

**MARINES IMPROVISE ARMORED TRUCKS.**

Marines engaged in the recent expeditions against the revolting natives of Haiti, armored two motor trucks, which they used to good advantage in action. Major-General Barnett is urging the adoption of a standard armored truck to cost about \$15,000 each, for the use of the navy on such occasions.

**USE FOR 5,000,000 CARS.**

The reasons on which American manufacturers base their estimates that 5,000,000 cars will eventually be used in the United States were given recently by Alfred Reeves, general manager of the National Automobile Chamber of Commerce, in an address before the automobile school of a New York Y. M. C. A. There are now less than 3,000,000 motor cars in use in the country—although the number is approaching that figure—and government statistics show that in 1910 there were 10,000,000 horse drawn vehicles in the United States. There are also 5,000,000 farms in the United States, one-half of which are without mortgage, and all of them have good use for a motor car. Export trade last year amounted to \$111,000,000. This is likely to grow rapidly with the trade distributed all over the world.

**CHASE OIL DELIVERY TRUCK.****Fitted with Demountable Tank to Obtain a Platform Body when Needed.**

With the purpose of meeting the requirements of owners who have need for an oil tank a part of the time, and who could use the vehicle for other service when not utilized for oil transportation, the Chase Motor Truck Company, Syracuse, N. Y., has designed an equipment that is mounted on a standard M-O  $3\frac{1}{2}$  ton chassis, and which is supplied to order.

The chassis is a worm driven type built to the Chase standard design in all details, and on this is mounted a regular stake platform body. The body is ironed for stakes and side or end panels and is suited for a wide diversity of uses. On this platform are saddles that are secured by four tie bolts and which can be quickly and easily removed when desired.

On the saddles is placed a steel oil tank that has capacity of 1000 gallons. The tank has three compartments, the divisions being by heavy plates, and each section is fitted with baffle plates to insure against damage such as would cause leakage from surging of the contents. Hooks are incorporated with the tank supports, so that the tank can be hoisted by a crane for removal or replacement on the chassis.

All the piping, spigots, etc., are secured to the supports for the tank and are accessible and operated from the rear of the machine. On either side of the tank is space sufficient to store a row of filler cans or cases of oil, and there are held by a tube railing. The compartments are approximately equal in capacity and are ordinarily designed for carrying gasoline, kerosene and one grade of lubricating oil. Other grades of lubricating oil may be carried in the small containers at the sides of the tank.

The construction of the equipment throughout is such that in comparatively short time the change from a tank truck to a platform truck may be made. The truck seen in the accompanying illustration is fitted with the new Smith all-metal wheels.



Chase  $3\frac{1}{2}$ -Ton Platform Truck Equipped with a Demountable Three-Compartment Oil Tank.



**For Manufacturers' Names, Addresses and Other Detail, See General Indices.**

**LOAD CAPACITY. UNDER 1000 POUNDS.**

[illegible]

**LOAD CAPACITY, 1000 POUNDS.**

Make	Detroit	Durayen	Falcon	Hanger	Haasbal	I. H. C.	I. H. C.	Keurns	Kieselkar	Kosmath	Lambert	Lawson
Model	II	A	A	II	A	M A	M W	D	.....	15	V 1	25
Capacity	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Chassis Price	.....	\$715	\$715	\$875	\$550	\$710	\$710	.....	\$950	\$675	\$900	.....
S. A. E. Rating	22.50	14.40	16.92	16.92	20.00	15.20	15.20	16.9	24.22	15.65	19.61	22 1/2
Engine Cyls	Four	Four	Four	Four	Four	Single	Single	Four	Four	Four	Four	Four
How tnat	Block	Block	Block	Block	Block	Single	Single	Block	Block	Block	Pairs	En bloc
Bore	3 3/4 x 3 3/4	3 x 4 1/2	3 x 4 1/2	3 3/4 x 5	3 3/4 x 5	3 3/4 x 5	3 3/4 x 5	3 3/4 x 5	3 3/4 x 5	3 3/4 x 5	3 3/4 x 5	3 3/4 x 5
Stroke	3 3/4	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2
Valve Location	Left	Head	Head	Left	Head	Top	Top	.....	Right	Right	Left	L head
No. Main Bear.	Three	Two	Two	Two	Two	Two	Two	Two	Three	Two	Three	Three
Max. R. P. M.	2800	1600	1600	1600	1600	1300	1300	3000	1160	.....	1700	2800
Lubrication	.....	Clr. spl.	Spl. pres.	Thermo	Spl. pres.	Spl. pres.	Spl. pres.	Spl. pres.	Clr. spl.	Spl. pres.	Clr. spl.	Clr. spl.
Cool. System	Thermo	Thermo	Thermo	Thermo	Thermo	Centrifugal	Centrifugal	Thermo	Centrifugal	Thermo	Centrifugal	Thermo
Radiator Type	Cell. sheet	Cell. sheet	Cell. sheet	Cell. sheet	Cell. sheet	Thin sheet	Thin sheet	Honey comb	Sq. t. sheet	Fin. sheet	Fin. sheet	Fin. sheet
Carburetor	Optional	Zenith	Zenith	Stromberg	Zenith	Holley	Holley	Carter	Stromberg	Holley	Schebler	Schebler
Ignition	Make, Dixie	.....	At-Kt.	K-W	Schebler	Holize	Holize	Connecticut	Stromberg	At-Kt.	Bosch	Bosch
Type, Control, Single, hand	Single, auto.	Single, hand	Single, hand	Single, hand	Dual, hand	Dual, hand	Dual, hand	Hand	Single, hand	Single, auto.	Dual, hand	Dual, hand
Governor Drive	.....	.....	.....	.....	.....	Motor	Motor	.....	Motor	.....	.....	.....
Speed, M. P. H.	58	30	30	25	.....	18	18	35	22	30	20	.....
Clutch Type	Wet disc	Cone	Cont. B.	Cone	Cont. B.	Cont. B.	Cont. B.	Dry disc	Cone	Dry plate	None	Disc
Trans. Gearset	Selective	Selective	Ind. C.	Selective	Ind. C.	Ind. C.	Ind. C.	Selective	Selective	Selective	Friction	Selective
Located, Speeds	Unit M. three	Unit M. three	Unit M. three	Unit M. three	Unit M. three	Unit M. three	Unit M. three	Unit M. three	Unit M. three	Unit M. three	Friction	Unit M
Driven by	Bevel	Bevel	Bevel	Top worm	Bevel	Double chain	Double chain	Shaft	Bevel	Bevel	Double chain	Double chain
Ratio to Rear	4 25-1	5.00-1	5.00-1	6.20-1	9.10-1	9.10-1	9.10-1	5-1	4.58-1	Bevel	.....	4 1/2-1
Tor. Taken by	Torsion arm	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Propelled by	Sub.-f.	Sub.-f.	Sub.-f.	Sub.-f.	Sub.-f.	Sub.-f.	Sub.-f.	Sub.-f.	Sub.-f.	Sub.-f.	Sub.-f.	Sub.-f.
Springs, For	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Rear	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase	112	106	106	110	106	90	90	107	115	100	106	112
Tire Type	Pneumatic	Pneumatic	Pneumatic	Pneumatic	Pneumatic	Solid	Solid	Pneumatic	Pneumatic	Pneumatic	Pneumatic	Pneumatic
Tire Size	38x1 3/4, 42x1 3/4	31x4	31x4	32x4	30x3 3/4, 30x3 1/2	42x2	42x2	30x3 3/4, 31x4	32x4	32x3 3/4, 31x4	30x3 3/4, 31x4	32x3 3/4, 32x3 1/2
Driver's Seat	Left	Left	Left	Left	Right	Right	Right	Left	Left	Left	Left	Left
Control Levers	Centre	Centre	Centre	Centre	.....	Right	Right	Centre	Centre	Centre	Right	Centre

# LOAD CAPACITY, 1000 POUNDS.

Make.....	Model.....	Capacity.....	W.....	Leachman	Lip. Stewart	Mercury	New London	Rotto	Rush	Studebaker	Vim	Wilcox	Bell	Brlaton	Dispatch
Model.....	Model.....	Capacity.....	W.....	Leachman	Lip. Stewart	Mercury	New London	Rotto	Rush	Studebaker	Vim	Wilcox	Bell	Brlaton	Dispatch
Capacity.....	Capacity.....	Capacity.....	W.....	Leachman	Lip. Stewart	Mercury	New London	Rotto	Rush	Studebaker	Vim	Wilcox	Bell	Brlaton	Dispatch
W.....	W.....	W.....	W.....	Leachman	Lip. Stewart	Mercury	New London	Rotto	Rush	Studebaker	Vim	Wilcox	Bell	Brlaton	Dispatch
Leachman	Leachman	Leachman	Leachman	Leachman	Lip. Stewart	Mercury	New London	Rotto	Rush	Studebaker	Vim	Wilcox	Bell	Brlaton	Dispatch
Lip. Stewart	Lip. Stewart	Lip. Stewart	Lip. Stewart	Lip. Stewart	Lip. Stewart	Mercury	New London	Rotto	Rush	Studebaker	Vim	Wilcox	Bell	Brlaton	Dispatch
Mercury	Mercury	Mercury	Mercury	Mercury	Mercury	Mercury	New London	Rotto	Rush	Studebaker	Vim	Wilcox	Bell	Brlaton	Dispatch
New London	New London	New London	New London	New London	New London	New London	New London	Rotto	Rush	Studebaker	Vim	Wilcox	Bell	Brlaton	Dispatch
Rotto	Rotto	Rotto	Rotto	Rotto	Rotto	Rotto	Rotto	Rotto	Rush	Studebaker	Vim	Wilcox	Bell	Brlaton	Dispatch
Rush	Rush	Rush	Rush	Rush	Rush	Rush	Rush	Rush	Rush	Studebaker	Vim	Wilcox	Bell	Brlaton	Dispatch
Studebaker	Studebaker	Studebaker	Studebaker	Studebaker	Studebaker	Studebaker	Studebaker	Studebaker	Studebaker	Studebaker	Vim	Wilcox	Bell	Brlaton	Dispatch
Vim	Vim	Vim	Vim	Vim	Vim	Vim	Vim	Vim	Vim	Vim	Vim	Wilcox	Bell	Brlaton	Dispatch
Wilcox	Wilcox	Wilcox	Wilcox	Wilcox	Wilcox	Wilcox	Wilcox	Wilcox	Wilcox	Wilcox	Wilcox	Wilcox	Bell	Brlaton	Dispatch
Bell	Bell	Bell	Bell	Bell	Bell	Bell	Bell	Bell	Bell	Bell	Bell	Bell	Bell	Brlaton	Dispatch
Brlaton	Brlaton	Brlaton	Brlaton	Brlaton	Brlaton	Brlaton	Brlaton	Brlaton	Brlaton	Brlaton	Brlaton	Brlaton	Brlaton	Brlaton	Dispatch
Dispatch	Dispatch	Dispatch	Dispatch	Dispatch	Dispatch	Dispatch	Dispatch	Dispatch	Dispatch	Dispatch	Dispatch	Dispatch	Dispatch	Dispatch	Dispatch

# LOAD CAPACITY, 1200 TO 1500 POUNDS.

Make.....	Model.....	Capacity.....	Henderson	Bauer	Holstrom	Brlaton	Commerce	Dart	Diamond	Gabriel	Gary	Gearford	G. M. C.	Genova
Model.....	Model.....	Capacity.....	Henderson	Bauer	Holstrom	Brlaton	Commerce	Dart	Diamond	Gabriel	Gary	Gearford	G. M. C.	Genova
Capacity.....	Capacity.....	Capacity.....	Henderson	Bauer	Holstrom	Brlaton	Commerce	Dart	Diamond	Gabriel	Gary	Gearford	G. M. C.	Genova
Henderson	Henderson	Henderson	Henderson	Henderson	Henderson	Henderson	Henderson	Henderson	Henderson	Henderson	Henderson	Henderson	Henderson	Henderson
Bauer	Bauer	Bauer	Bauer	Bauer	Bauer	Bauer	Bauer	Bauer	Bauer	Bauer	Bauer	Bauer	Bauer	Bauer
Holstrom	Holstrom	Holstrom	Holstrom	Holstrom	Holstrom	Holstrom	Holstrom	Holstrom	Holstrom	Holstrom	Holstrom	Holstrom	Holstrom	Holstrom
Brlaton	Brlaton	Brlaton	Brlaton	Brlaton	Brlaton	Brlaton	Brlaton	Brlaton	Brlaton	Brlaton	Brlaton	Brlaton	Brlaton	Brlaton
Commerce	Commerce	Commerce	Commerce	Commerce	Commerce	Commerce	Commerce	Commerce	Commerce	Commerce	Commerce	Commerce	Commerce	Commerce
Dart	Dart	Dart	Dart	Dart	Dart	Dart	Dart	Dart	Dart	Dart	Dart	Dart	Dart	Dart
Diamond	Diamond	Diamond	Diamond	Diamond	Diamond	Diamond	Diamond	Diamond	Diamond	Diamond	Diamond	Diamond	Diamond	Diamond
Gabriel	Gabriel	Gabriel	Gabriel	Gabriel	Gabriel	Gabriel	Gabriel	Gabriel	Gabriel	Gabriel	Gabriel	Gabriel	Gabriel	Gabriel
Gary	Gary	Gary	Gary	Gary	Gary	Gary	Gary	Gary	Gary	Gary	Gary	Gary	Gary	Gary
Gearford	Gearford	Gearford	Gearford	Gearford	Gearford	Gearford	Gearford	Gearford	Gearford	Gearford	Gearford	Gearford	Gearford	Gearford
G. M. C.	G. M. C.	G. M. C.	G. M. C.	G. M. C.	G. M. C.	G. M. C.	G. M. C.	G. M. C.	G. M. C.	G. M. C.	G. M. C.	G. M. C.	G. M. C.	G. M. C.
Genova	Genova	Genova	Genova	Genova	Genova	Genova	Genova	Genova	Genova	Genova	Genova	Genova	Genova	Genova

Abbreviations: Price, \* vehicle complete. Valve location, opp., T head; right or left, L head; R or L and H, side and head; top, horizontal opposed engine; two-cy., two-cycle. Lubrication, spl. pres., splash and pressure; cl. spl., circulating splash; fuel, injected with fuel; P. & S., pump and splash; cooling, thermo, thermo-siphon; cent., centrifugal pump; gear, gear pump. Radiator type, sq.-sheet, square or flat tube, sheet metal case; fin. tube, fin. tube core, cast aluminum case; cell, sheet, cellular core, sheet metal case; ring cast, copper tube in ring, aluminum tank; sq.-t. cast, square tube core, cast aluminum case; Z-Z-t. sheet, zig-zag tube core, sheet metal case. Ignition, At.-Kt., Atwater Kent; auto, automatic spark advance; auto H., automatic advance; 2-pt., two-point, fixed, battery circuit retarded, magneto circuit advanced. Governor Drive, D, shaft, driving shaft; Clutch Type, C, band, contracting band; R, cone, reversed cone. Transmission, Gearset, ind. C., constant mesh individual clutch; inf. infinite speeds; unit M. unit with engine; unit J, unit with axle. Driven by, int.-g.-f., internal gear, front wheels; double red., double reduction; int.-g.-f., 4, internal gear, four wheels. Torque Taken by, sub F, sub-frame. Propelled by, springs, rear springs; sub F, sub-frame.

## MECHANICAL SPECIFICATIONS OF AMERICAN 1916 GASOLINE MOTOR WAGONS AND TRUCKS.

For Manufacturers' Names, Addresses and Other Detail, See General Indices.

## LOAD CAPACITY, 1500 POUNDS.

Make.....	Hewlett-Ludlow, H. C.	Jeffery	Krebs	Lawson	Lincoln	Lip. Stewart	Memomilac	Palmer Moore	Paradling	Reo
Model.....	F	1016	F	D	D	W	K	K	D 1	F
Capacity.....	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Chassis Price.....	\$950	\$900	\$1600	\$900	\$900	\$1600	\$1125	\$1150	\$975	\$1000
S. A. E. Rating.....	20	22.50	22.50	20	22.50	22.50	22.50	19.61	16.92	27.20
Engine Cyls.....	Four	Four	Four	Four	Four	Four	Four	Four	Four	Four
How Cast.....	Block	Block	Block	Block	Block	Block	Block	Block	Block	Pairs
Bore, Stroke.....	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5	3 1/2 x 5	3 1/2 x 5	3 1/2 x 5 1/2	3 1/2 x 5	3 1/2 x 5 1/2	3 1/2 x 5	4 1/2 x 4 1/2
Valve Location.....	Top	Right	Right	3 1/2 x 5	Head	Left	Right	Right	Right	R. & H.
No. Main Bear. Three	Two	Three	Three	Three	Three	Three	Three	Three	Three	Three
Max. R. P. M.....	1300	2400	1190	1500	1500	1800	1286	1275	1000	.....
Lubrication.....	Spl. pres.	Spl. pres.	Clr. spl.	Thermo	Thermo	Spl. pres.	Clr. spl.	Thermo	Spl. pres.	Clr. spl.
Cool. System.....	Centrifugal	Centrifugal	Centrifugal	Thermo	Thermo	Centrifugal	Thermo	Thermo	Thermo	Centrifugal
Radiator Type.....	Thin sheet	Cell. cast	Fin. sheet	Fin. cast	Fin. cast	Fin. sheet	Fin. sheet	Fin. cast	Z-Z-t. sheet	Fin. sheet
Carburetor.....	Stromberg	Stromberg	Schebler	Stromberg	Stromberg	Zenith	Stromberg	Zenith	Kingston	Johnson
Ignition, Make.....	Dixie	Dixie	Bosch	Spltdorf	Bosch	Elsemann	Bosch	Bosch	Kingston	Remy
Type, Control.....	Single, hand	Dual, hand	Single, auto.	.....	Single, fixed	Single, fixed	Single, hand	Single, auto.	Dual, hand	Single, hand
Governor Drive Shaft	Motor	Motor	Motor	.....	.....	.....	.....	.....	.....	.....
Speed, M. P. H.....	17 1/2	40	20	.....	.....	20	25	20	18	22
Clutch Type.....	Cone B	Dry plate	Cone	Disc	Cone	Cone	Dry disc	Dry disc	Dry disc	Dry disc
Trans. Gearset.....	Ind. C.	Ind. C.	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective
Located, Speeds.....	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three
Driven by.....	Double chain	Spiral, bevel	Top worm	.....	.....	Top worm	Sp. bev.	Int. gear	Int. gear	Revel
Ratio Gear Red.....	9.10-1	4.50-1	6.00-1	.....	.....	6.00-1	5.16-1	6.83-1	6.00-1	4.00-1
Tor. Taken by.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Propelled by.....	Radius rod	.....	.....	.....	.....	.....	.....	.....	.....	.....
Springs, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	.....	.....	.....	.....	.....	.....	.....
Springs, Rear.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	.....	.....	.....	.....	.....	.....	.....
Wheelbase.....	124	116	120	120	122	125 or 135	124	106	120	120
Tire Type.....	Solid	Pneumatic	Pneumatic	.....	.....	.....	.....	.....	.....	.....
Tire Sizes.....	34x3, 34x4	34x4 1/2, 35x4 1/2	34x4 1/2, 34x4 1/2	34x4, 34x4	34x5, 33x5	35x4 1/2, 35x4 1/2	34x3 1/2, 34x3 1/2	36x3, 36x3 1/2	36x3, 36x3 1/2	34x4 1/2, 34x4 1/2
Driver's Seat.....	Left	Left	Left	Left	Left	Left	Left	Left	Left	Left
Control Levers.....	Centre	Centre	Centre	Centre	Centre	Centre	Centre	Centre	Centre	Centre

## LOAD CAPACITY, 1500 POUNDS.

Make.....	South Bend	Sterling	Stewart	White	Wilcox	Yonge
Model.....	3	3	3	G H B E	I	II F
Capacity.....	1500	1500	1500	1500	1500	2000
Chassis Price.....	\$1475	\$935	\$1250	\$2100	\$1200	\$1500
S. A. E. Rating.....	22.50	15.64	19.61	22.50	19.61	19.6
Engine Cyls.....	Four	Four	Four	Four	Four	Four
How Cast.....	Block	Block	Block	Block	Block	Block
Bore, Stroke.....	3 1/2 x 5	3 1/2 x 5 1/2	3 1/2 x 5	3 1/2 x 5 1/2	3 1/2 x 5	3 1/2 x 5
Valve Location.....	Right	Right	Right	Right	Left	Left
No. Main Bear. Three	Three	Three	Three	Two	Three	Three
Max. R. P. M.....	1800	1333	1500	.....	1500	1700
Lubrication.....	Clr. spl.	Clr. spl.	Spl. pres.	Spl. pres.	Clr. spl.	Spl. pres.
Cool. System.....	Thermo	Thermo	Thermo	Centrifugal	Thermo	Centrifugal
Radiator Type.....	Cell. sheet	Fin. sheet	Fin. sheet	Cell. sheet	Fin. cast	Fin. cast
Carburetor.....	Stromberg	Schebler	Schebler	White	Optional	Rayfield
Ignition, Make.....	Bosch	Bosch	Bosch	Bosch	Bosch	Elsemann
Type, Control.....	Single, hand	Single, hand	Single, hand	Single, hand	Single, hand	Single, fixed
Governor Drive Suction	.....	.....	.....	.....	.....	.....
Speed, M. P. H.....	25	20	25	.....	20	17
Clutch Type.....	Wet disc	Dry disc	Dry disc	Wet plate	Dry disc	Dry disc
Trans. Gearset.....	Selective	Selective	Selective	Selective	Selective	Selective
Located, Speeds.....	Unit M, three	Unit M, three	Unit M, three	Unit M, four	Unit M, three	Unit M, three
Driven by.....	Top worm	Top worm	Int. gear	Int. gear	Top worm	Top worm
Ratio Gear Red.....	6.50-1	7.00-1	6.00-1	Revel	6.20-1	7.75-1
Tor. Taken by.....	.....	.....	.....	.....	.....	.....
Propelled by.....	.....	.....	.....	.....	.....	.....
Springs, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	Radius rod	1/2 elliptic	1/2 elliptic
Springs, Rear.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.....	128	127	118	133 1/2	120	128
Tire Type.....	Pneumatic	Pneumatic	Pneumatic	Pneumatic	Pneumatic	Pneumatic
Tire Sizes.....	34x4 1/2, 34x4 1/2	34x4 1/2, 34x4 1/2	34x4 1/2, 34x4 1/2	34x4 1/2, 34x4 1/2	34x4 1/2, 35x4 1/2	34x5, 34x5
Driver's Seat.....	Right	Left	Left	Left	Left	Left
Control Levers.....	Centre	Centre	Centre	C. & L.	Centre	Centre

## LOAD CAPACITY, 2000 POUNDS.

Make.....	Atterbury	Adams	Wilcox	Yonge	Republ
Model.....	4 B	A	I	II F	F
Capacity.....	2000	2000	1500	2000	1500
Chassis Price.....	\$1775	\$1850	\$1200	\$1500	\$995
S. A. E. Rating.....	22.50	22.50	22.50	19.6	19.61
Engine Cyls.....	Four	Four	Four	Four	Four
How Cast.....	Block	Block	Block	Block	Block
Bore, Stroke.....	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5	3 1/2 x 5	3 1/2 x 5
Valve Location.....	Left	Right	Left	Left	Right
No. Main Bear. Three	Three	Three	Three	Three	Three
Max. R. P. M.....	1200	2200	1500	1700	1200
Lubrication.....	Clr. spl.	Clr. spl.	Spl. pres.	Spl. pres.	Spl. pres.
Cool. System.....	Thermo	Centrifugal	Thermo	Centrifugal	Thermo
Radiator Type.....	Fin. cast	Fin. sheet	Cell. sheet	Fin. cast	Fin. cast
Carburetor.....	Zenith	Zenith	Optional	Rayfield	Stromberg
Ignition, Make.....	Bosch	Elsemann	Bosch	Elsemann	Bosch
Type, Control.....	Single, fixed	Single, auto.	Single, hand	Single, fixed	Single, fixed
Governor Drive Suction	.....	.....	.....	.....	.....
Speed, M. P. H.....	16 1/2	25	20	17	18
Clutch Type.....	Dry plate	Dry disc	Dry disc	Dry disc	Dry disc
Trans. Gearset.....	Selective	Selective	Selective	Selective	Selective
Located, Speeds.....	Unit M, four	Unit J, three	Unit M, three	Unit M, three	Unit M, three
Driven by.....	Top worm	Top worm	Top worm	Top worm	Top worm
Ratio Gear Red.....	7.75-1	7.45-1	6.20-1	7-1	7.00-1
Tor. Taken by.....	.....	.....	.....	.....	.....
Propelled by.....	.....	.....	.....	.....	.....
Springs, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Rear.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.....	114	136	120	128	132
Tire Type.....	Solid	Solid	Pneumatic	Pneumatic	Solid
Tire Sizes.....	36x3 1/2, 36x5	36x3 1/2, 36x4	34x5, 34x5	34x5, 34x5	36x3 1/2, 36x4
Driver's Seat.....	Left	Left	Left	Left	Left
Control Levers.....	Right	Centre	Centre	Centre	Centre

# LOAD CAPACITY, 2000 POUNDS.

Make	Barker	Bausmer	Huick	Chanc	Continental (C)	Dart	Denby	Diamond T	Kellpac	Fargo
Model	U	G	D-4	A	C A 1	B	R	J B	10	L
Capacity.....	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Chassis Price.....	\$2000	\$975	\$1150	\$1650	\$1550	\$2250	\$1020	\$1485	\$1500	\$1250
S. A. E. Rating.....	25.60	19.61	22.50	22.50	22.50	19.61	15.64	19.60	23	19.60
Engine Cyls.....	Four	Four	Four	Four	Four	Four	Four	Four	Four	Four
How Cast.....	Block	Block	Pairs	Block	Block	Block	Block	Block	Block	Block
Bore, Stroke.....	4x5	3 1/2 x 5	3 1/2 x 5	3 1/2 x 5	3 1/2 x 5	3 1/2 x 5	3 1/2 x 5	3 1/2 x 5	3 1/2 x 5	3 1/2 x 5
Valve Location.....	Left	Right	Head	Left	Left	Right	Right	Right	Right	Right
No. Main Bearings.....	1500	Three	Three	Three	Three	Three	Three	Three	Three	Three
Max. R. P. M.....	1500	1200	1200	1200	1200	1200	1650	1500	1100	1100
Lubrication.....	Spl. pres.	Clr. spl.	Clr. spl.	Clr. spl.	Clr. spl.	Spl. pres.	Clr. spl.	Clr. spl.	Spl. pressure	Spl. pressure
Cool. System.....	Thermo	Thermo	Centrifugal	Centrifugal	Centrifugal	Thermo	Thermo	Thermo	Thermo	Thermo
Radiator Type.....	Cell. sheet	Cell. cast.	Cell. sheet	Fin. cast.	Fin. cast.	Cell. sheet	Sq. t. sheet	.....	.....	Fin. sheet
Ignition.....	Stromberg	Rayfield	Marvel	Stromberg	Stromberg	Stromberg	Zenith	Rayfield	.....	Rayfield
Carburetor.....	Elsemann	Bosch	Delco	Elsemann	Elsemann	Elsemann	Dixie	Bosch	.....	Bosch
Type, Control.....	Single, hand	Single, hand	Single, auto-h.	Single, fixed	Single, fixed	Single, hand	Single, fixed	Single, fixed	.....	Single, foot
Governor Drive.....	.....	.....	.....	Motor	Motor	Motor	Motor	.....	.....	Motor
Speed, M. P. H.....	27	21	.....	18	16	22	20	23	.....	18
Clutch Type.....	Dry plate	Dry disc	Cone	Dry plate	Dry disc	Dry disc	Dry plate	Dry disc	Disc	Dry disc
Trans. Gearset.....	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective
Located, Speeds.....	Unit M, four	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three
Driven by.....	Top worm	Int. gear	Int. gear	Top worm	Top worm	Double chain	Int. gear	Top worm	.....	Int. gear
Ratio.....	7.00-1	7.00-1	6.60-1	7.5-1	7.75-1	8.25-1	8.25-1	7.75-1	.....	7.4-1
Tor. Taken by.....	Spring	Spring	Torsion tube	Spring	Spring	Spring	Spring	Spring	.....	Spring
Propelled by.....	Spring	Spring	Torsion tube	Spring	Spring	Radius rod	Spring	Spring	.....	Spring
Spring, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	.....	1/2 elliptic
Spring, Rear.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	.....	1/2 elliptic
Wheelbase.....	130	124	122	138	138	138	138	132	138	130
Tire Type.....	Solid	Solid	Pneumatic	Solid	Solid	Solid	1" & S.	Solid	.....	Solid
Tire Size.....	42x3 1/2, 42x5	35x3, 35x3 1/2	35x5, 35x5	34x3, 36x4	34x3, 36x4	36x3, 36x3 1/2	34x4 1/2, 34x3-4	36x3 1/2, 36x4	.....	36x3, 36x4
Driver's Seat.....	Left	Left	Left	Left	Left	Left	Left	Left	Left	Left
Control Levers.....	Centre	Centre	Centre	Centre	Centre	Centre	Centre	Centre	Centre	Centre

# LOAD CAPACITY, 2000 POUNDS.

Make	Garford	titube	Henderson	Hewitt-Ludlow	Indepndent	Indian	Kieselkar	Kochler
Model	75	titube	D	F	F	q	K	K
Capacity.....	2000	2000	2000	2000	2000	2000	2000	2000
Chassis Price.....	\$1450	\$1175	\$1500	\$1800	\$1255	\$1385	\$1500	\$940
S. A. E. Rating.....	19.61	25	22.50	20	19.61	19.61	24.22	19.61
Engine Cyls.....	Four	Six	Four	Four	Four	Four	Four	Four
How Cast.....	Block	Block	Block	Block	Block	Block	Block	Block
Bore, Stroke.....	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2
Valve Location.....	Left	L head	Right	Right	Right	Right	Right	Head
No. Main Bearings.....	Three	Three	Three	.....	Three	Three	Three	Three
Max. R. P. M.....	1000	3400	2000	1350	1350	1400	1200	2150
Lubrication.....	Clr. spl.	Spl. pres.	Clr. spl.	Spl. pres.	Clr. spl.	Clr. spl.	Clr. spl.	Clr. spl.
Cool. System.....	Centrifugal	Centrifugal	Thermo	Thermo	Thermo	Centrifugal	Centrifugal	Thermo
Radiator Type.....	Cell. sheet	Fin. cast.	Thin sheet	Thin sheet	Z-Z-t. sheet	Fin. cast.	Sq. t. sheet	Fin. cast.
Carburetor.....	Rayfield	Master	Zenith	Stromberg	Marvel	Stromberg	Stromberg	Optional
Ignition.....	Dixie	Dixie	Husoh	Remy	Elsemann	Bosch	Elsemann	Optional
Type, Control.....	Single, hand	Single, fixed	Single, hand	Disc	Single, fixed	Single, fixed	Single, hand	Single, hand
Governor Drive.....	Motor	D. shaft	Motor	.....	Motor	Motor	Motor	.....
Speed, M. P. H.....	17	16	25	17	18	20	17	30
Clutch Type.....	Dry disc	Dry disc	Dry disc	Cone	Dry disc	Dry disc	Cone	Cone
Trans. Gearset.....	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective
Located, Speeds.....	Unit M, three	Unit M, 3	Unit M, three	Amld., three	Unit M, three	Unit M, three	Unit M, three	Unit M, three
Driven by.....	Top worm	Internal gear	Top worm	Int. gear	Top worm	Top worm	Top worm	Int. gear
Ratio.....	6.50-1	6 and 8.2-1	8.25-1	8.00-1	7.75-1	7.75-1	7.75-1	7.00-1
Tor. Taken by.....	Spring	Spring	Spring	Spring	Spring	Spring	Spring	Spring
Propelled by.....	Spring	Spring	Spring	Spring	Spring	Spring	Spring	Spring
Spring, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Spring, Rear.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.....	120	126	124	126	128	130	135	129
Tire Type.....	P. or S.	Solid	Pneumatic	Solid	Solid	Solid	Pneumatic	Solid
Tire Size.....	34x4 1/2, 36x4	34x3 1/2, 34x4	35x5, 35x5	37x3 1/2, 37x4	36x3, 36x3 1/2	36x3 1/2, 36x4	35x4 1/2, 35x4 1/2	34x3, 34x3 1/2
Driver's Seat.....	Right	Left	Left	Left	Left	Left	Left	Right
Control Levers.....	Centre	Centre	Centre	Centre	Centre	Centre	Centre	Centre

Abbreviations: P, pressure; C, circulating splash; T, head; R or L and H, side and head; top, horizontal opposed engine; two-cy., two-cycle. Lubrication, spl. pres., splash and pressure; clr. spl., centrifugal pump; gear, gear pump. Radiator type, sq. t. sheet, square or flat tube, sheet metal case; fin. sheet, fin. tube core, sheet metal case; Z-Z-t. sheet, zig-zag cellular core, sheet metal case; ring cast, copper tube in ring, aluminum tank; sq. t. cast, square tube core, cast aluminum case; cell. cast, cellular core, cast aluminum case; Z-Z-t. sheet, zig-zag tube core, sheet metal case. Ignition, At-K, Atwater Kent; auto, automatic spark advance; auto H, automatic advance, hand adjustment; 2-pt., two-point, fixed, battery circuit retarded, magneto circuit advanced. Governor Drive, D, shaft, driving shaft; Clutch Type, exo. shoe, expanding shoe; con. band, contracting band; R, cone, reversed cone. Transmission Gearset, ind. C, constant mesh individual clutch; inf. infinite speeds; unit M, unit with engine; unit X, unit with jackshaft; unit Y, unit with axle. Driven by, int.-g.-f., internal gear, front wheel; double red., double reduction; int.-g. 4, internal gear, four wheels. Torque Taken by, sub F, sub-frame. Propelled by, springs, rear springs; sub F, sub-frame.

# MECHANICAL SPECIFICATIONS OF AMERICAN 1916 GASOLINE MOTOR WAGONS AND TRUCKS.

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## LOAD CAPACITY, 2000 POUNDS.

Make.	Landshaft	Range	Little Giant	Lip. Stewart	Lombard	Maccor	Maccor	Mack	Memomine	Modern	Moreland
Model.....	G 1	C	H	H	.....	K	L	A B	F	T	.....
Capacity.....	2000	2000	2000	2000	2000	2000	2000	2000	2500	2000	2000
Chassis Price.....	\$1250	\$1850	\$1350	\$2000	\$2100	\$2100	\$2100	\$2000	\$1575	\$1575	\$1550
S. A. E. Rating.....	19.61	22.50	19.61	22.50	27.20	27.20	27.20	25.60	22.50	19.61	22.50
Engine Cyls.....	Four	Four	Four	Four	Four	Four	Four	Four	Four	Four	Four
How Cast.....	Block	Block	Block	Block	Block	Block	Block	Block	Block	Block	Block
Bore, Stroke.....	3 3/4 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2
Valve Location.....	Left	Left	Right	Left	Left	Left	Left	Right	Left	Right	Left
No. Main Hear.....	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three
Max. R. P. M.....	1000	1250	1200	1150	1600	1000	1000	1160	1308	.....	1150
Lubrication.....	Clr. spl.	Clr. spl.	Spl. pres.	Spl. pres.	Pressure	Spl. pres.	Spl. pres.	Spl. pres.	Clr. spl.	Spl. pres.	Clr. spl.
Cool. System.....	Thermo	Thermo	Thermo	Thermo	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Thermo	Thermo
Radiator Type.....	Sq.-t. sheet	Sq.-t. sheet	Sq.-t. sheet	Sq.-t. sheet	Fin. cast.	Fin. cast.	Fin. cast.	Fin. cast.	Fin. cast.	Fin. cast.	Fin. cast.
Ignition.....	Rayfield	Stromberg	Zenith	Zenith	Stewart	Stromberg	Stromberg	Stromberg	Stromberg	Zenith	Optional
Ignition, Make.....	Swiss	Bosch	Elsemann	Elsemann	.....	Bosch	Bosch	Bosch	Bosch	Bosch	Optional
Type, Control.....	Single, hand	Single, hand	Single, fixed	Single, fixed	Dual, hand	Single, hand	Single, hand	Single, hand	Single, hand	Single, fixed	Single, hand
Governor Drive.....	Motor	Motor	Motor	Motor	Motor	Helical gear	Helical gear	Helical gear	D. shaft	.....	.....
Speed, M. P. H.....	15	15	18	18	Six	16	16	18 1/2	16	.....	18
Clutch Type.....	Dry disc	Wet disc	Wet disc	Wet disc	Wet disc	Dry disc	Dry disc	Dry disc	Dry disc	Dry disc	Dry disc
Trans. Gearset.....	Selective	Selective	Selective	Selective	.....	Selective	Selective	Selective	Selective	Selective	Selective
Located, Speeds.....	Unit M, three	Unit M, three	Unit M, three	Unit M, three	.....	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three
Driven by.....	Top worm	Double chain	Double chain	Double chain	Top worm	Double chain	Double chain	Top worm	Top worm	Top worm	Top worm
Ratio Gear Red.....	7.00-1	8.00-1	6.88-1	6.75-1	.....	6.75-1	6.75-1	6.75-1	5.16-1	7.75-1	6.00-1
Tor. Taken by.....	Springs	Springs	Springs	Springs	.....	Springs	Springs	Springs	Springs	Springs	Torsion arm
Propelled by.....	Springs	Radius rod	Radius rod	Radius rod	.....	Radius rod	Radius rod	Radius rod	Radius rod	Springs	Springs
Springs, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Rear.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.....	134	130	110	145	.....	138 and 150	138 and 150	132 or 144	132	132	136
Tire Type.....	Solid	Solid	Solid	Solid	Steel	Solid	Solid	Solid	Solid	Solid	Solid
Tire Size.....	34x3 1/2, 36x4	35x3 1/2, 38x4	37x4, 37x4	38x3, 36x5	.....	38x4, 36x5	38x4, 36x5	38x4, 36x3 1/2 d	38x3 1/2, 36x5	38x3, 36x4	34x3 1/2, 34x4
Driver's Seat.....	Left	Left	Right	Left	Left	Left	Left	Left	Left	Right	Right
Control Levers.....	Centre	Centre	Centre	Centre	.....	Centre	Centre	Centre	Centre	Centre	Centre

## LOAD CAPACITY, 2000 TO 3000 POUNDS.

Make.	Nel. & Le Moon	Palmer	Palmer Moore	Paulding	Republie	Rowe	Sanford	Selden	Service	Signal
Model.....	E 1	.....	M	G G 1	E	C W	R	T	T	R
Capacity.....	2000	2000	2000	2000	2000	2000	2000	2500	2000	2000
Chassis Price.....	\$1700	\$1350	\$1350	\$1300	\$1275	\$2450	\$1350	\$1700	\$1375	\$1550
S. A. E. Rating.....	22.50	22.50	22.50	25.60	25.60	19.61	19.61	19.61	19.61	22.50
Engine Cyls.....	Four	Four	Four	Four	Four	Four	Four	Four	Four	Four
How Cast.....	Block	Block	Block	Block	Block	Block	Block	Block	Block	Block
Bore, Stroke.....	4 3/4 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2	4x5	3 3/4 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2
Valve Location.....	Left	Right	Left	Right	Right	Left	Right	Right	Right	Left
No. Main Hear.....	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three
Max. R. P. M.....	1000	.....	1150	1000	1000	1200	1500	1130	1200	1200
Lubrication.....	Clr. spl.	Clr. spl.	Clr. spl.	Spl. pres.	Spl. pres.	.....	Clr. spl.	Clr. spl.	Spl. pres.	Spl. pres.
Cool. System.....	Centrifugal	Thermo	Thermo	Thermo	Thermo	Centrifugal	Centrifugal	Thermo	Thermo	Centrifugal
Radiator Type.....	Sq.-t. sheet	Cell. cast.	Fin. cast.	Z-Z-t. sheet	Fin. sheet	Sq.-t. sheet	Fin. cast.	Sq.-t. sheet	Fin. sheet	Fin. cast.
Ignition.....	Rayfield	Stromberg	Zenith	Kingston	Stromberg	.....	Schebler	Stromberg	Stromberg	Stromberg
Ignition, Make.....	Swiss	Bosch	Bosch	Kingston	Bosch	.....	Schebler	Stromberg	Stromberg	Stromberg
Type, Control.....	Single	Single, fixed	Single, auto.	Dual, hand	Single, fixed	Single, hand	Single, fixed	Single, fixed	Single, hand	Single, fixed
Governor Drive.....	Motor	Motor	Duplex	.....	.....	Motor	.....	Motor	.....	Motor
Speed, M. P. H.....	16	18	18	18	15	.....	18	17	18	15
Clutch Type.....	Dry disc	Dry disc	Dry disc	Dry disc	Dry disc	Dry disc	Dry disc	Dry disc	Dry disc	Dry disc
Trans. Gearset.....	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective
Located, Speeds.....	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, four	Unit M, three	Unit M, three	Unit M, three	Unit M, three
Driven by.....	Top worm	Int. gear	Int. gear	Int. gear	Int. gear	Top worm	Int. gear	Top worm	Top worm	Top worm
Ratio Gear Red.....	6.75-1	6.83-1	6.83-1	6.00-1	7.00-1	.....	.....	6.75-1	6.75-1	7.75-1
Tor. Taken by.....	Springs	Springs	Springs	Springs	Springs	Springs	Springs	Springs	Springs	Springs
Propelled by.....	Springs	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod
Springs, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Rear.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.....	124	116 1/2	126	120	144	130	138	126 1/2	135	144
Tire Type.....	Solid	P. & S.	Solid	Solid	Solid	Solid	Pneumatic	Solid	Solid	Solid
Tire Size.....	36x3, 36x4	34x3 1/2, 31x6	35x4 1/2, 36x4	36x3 1/2, 36x4	34x3, 34x4	34x3 1/2, 34x4	34x4 1/2, 35x5	34x3, 34x4	34x3, 34x4	34x3, 36x4
Driver's Seat.....	Right	Left	Left	Left	Left	Left	Left	Right	Left	Left
Control Levers.....	Centre	Centre	.....	Centre	Centre	Centre	Centre	Centre	Centre	Centre



# LOAD CAPACITY, 2000 TO 3000 POUNDS.

Make.	Stewart II	Stewart C	Studebaker	Superior	Twins City	Wichita	Wilcox	Wisconsin	Witt-Will
Model.	4	A	7	A	E	A	S	A	W D 1
Capacity.	2500	2000	2000	2000	2000	2000	2000	2000	2240
Chassis Price.	\$1390	\$700	\$1100	\$1350	\$2000	\$1650	\$1600	\$1650	\$1850
S. A. E. Rating	19.61	24.22	24.22	19.61	20.00	19.61	19.61	19.61	22.50
Engine Cyls.	Four	Four	Four	Four	Four	Four	Four	Four	Four
How Cast.	Block	Block	Block	Block	Block	Block	Block	Block	Block
Bore, Stroke.	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2
Valve Location	Right	Left	Left	Right	Left	Left	Left	Left	Left
No. Main Bearings	Three	Three	Three	Three	Three	Two	Two	Two	Three
Max. R. P. M.	1500	1200	1200	1200	1200	1080	1500	1008	1008
Lubrication	Cir. spl.	Cir. spl.	Cir. spl.	Cir. spl.	Cir. spl.	Cir. spl.	Cir. spl.	Cir. spl.	Cir. spl.
Cool. System	Thermo	Thermo	Thermo	Thermo	Thermo	Thermo	Thermo	Thermo	Thermo
Radiator Type	Cell. sheet	Cell. sheet	Cell. sheet	Cell. sheet	Cell. sheet	Cell. sheet	Cell. sheet	Cell. sheet	Cell. sheet
Carburetor	Zenith	Schebler	Schebler	Schebler	Schebler	Schebler	Schebler	Schebler	Schebler
Ignition	Make. Bosch	Kingston	Kingston	Kingston	Kingston	Kingston	Kingston	Kingston	Kingston
Type, Control	Single, fixed	Dual, hand	Single, hand	Single, fixed	Single, hand	Single, hand	Single, hand	Single, hand	Single, auto
Governor Drive	.....	.....	F. wheel	Automatic	Motor	.....	Motor	Motor	Motor
Speed, M. P. H.	20	18	20	17	16	15	18	18	18
Clutch Type	Dry disc	Dry disc	Cone	Dry disc	Wet disc	Cone	Dry disc	Cone	Dry disc
Trans. Gearset	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective
Located, Speeds	Unit M, three	Unit X, three	Unit M, three	Unit M, three	Unit J, three	Unit J, three	Unit M, three	Unit M, three	Unit M, three
Driven by	Int. gear	Int. gear	Int. gear	Int. gear	Double chain	Double chain	Top worm	Top worm	Top worm
Ratio Gear Red.	7.00-1	7.00-1	7.00-1	7.00-1	7.50-1	7.32-1	6.50-1	6.50-1	6.00-1
Tor. Taken by	Springs	Torsion arm	Torsion arm	Springs	Radius rod	Radius rod	Springs	Springs	Springs
Propelled by	Springs	Radius rod	Radius rod	Springs	Radius rod	Radius rod	Springs	Springs	Springs
Springs, For.	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Rear.	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.	128	126	126	124	130	110	128	154	120
Tire Type	Solid	Pneumatic	Pneumatic	Solid	Solid	Solid	Pneumatic	Solid	Solid
Tire Sizes	35x3 1/2, 35x4	35x3 1/2, 34x4	35x3 1/2, 34x4	35x3 1/2, 34x4	35x3 1/2, 34x3 1/2	34x3, 34x5	35x5, 35x6	35x3 1/2, 34x4	35x3 1/2, 34x4
Driver's Seat	Left	Left	Left	Left	Right	Right	Left	Left	Left
Control Levers	Centre	Centre	Centre	Centre	Right	Centre	Centre	Centre	Centre

# CAPACITY, 2000 TO 3000 POUNDS.

Make.	Zeller & Lum.	Zeller & Lum.	Adams	Atterbury	Linker	Hessmer	Continental (C) Croce	De Kalb	Deanby	Diamond	Donae
Model.	1 T C	1 S II	D	6 R	U	A	C B 1 1/2	D-1	G	J-2	1916
Capacity.	2000	2000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Chassis Price.	\$1600	\$1500	\$2300	\$1875	\$1550	\$1800	\$1750	\$1950	\$1575	\$2050	\$23000
S. A. E. Rating	23	20	27.20	22.5	25.6	27.20	25.60	27.20	19.61	27.20	28.9
Engine Cyls.	Four	Four	Four	Four	Four	Four	Four	Four	Four	Four	Four
How Cast.	Block	Block	Block	Block	Block	Block	Block	Block	Block	Block	Block
Bore, Stroke.	3 1/2 x 5 1/2	3 1/2 x 5 1/2	4 x 5 1/2	3 1/2 x 5 1/2	4 x 5 1/2	4 x 5 1/2	4 x 5 1/2	4 x 5 1/2	3 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2
Valve Location	Left	Right	Right	Left	Left	Right	Left	Left	Right	Left	Right
No. Main Bearings	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three
Max. R. P. M.	.....	.....	2200	1200	1500	1140	.....	1100	1375	1200	1000
Lubrication	Spl. pres.	Cir. spl.	Cir. spl.	Cir. spl.	Thermo	Cir. spl.	Cir. spl.	Spl. pres.	Thermo	Cir. spl.	Cir. spl.
Cool. System	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Thermo	Centrifugal	Centrifugal	Centrifugal	Thermo	Centrifugal	Centrifugal
Radiator Type	Cell. cast.	Fin. sheet	Fin. sheet	Fin. cast	Cell. sheet	Fin. cast	Sq.-t. cast.	Fin. sheet	Sq.-t. cast.	Sq.-t. sheet	Fin. cast.
Carburetor	Stromberg	Zenith	Zenith	Zenith	Stromberg	Rayfield	Stromberg	Stromberg	Stromberg	Rayfield	Schebler
Ignition	Make. Bosch	Eisemann	Eisemann	Bosch	Stromberg	Bosch	Eisemann	Eisemann	Eisemann	Bosch	Bosch
Type, Control	Foot, hand	Centrifugal	Centrifugal	Single, fixed	Single, auto	Single, hand	Single, fixed	Single, hand	Single, fixed	Single, fixed	Dual, hand
Governor Drive	.....	Automatic	Automatic	Motor	.....	Motor	.....	Motor	Motor	Motor	Motor
Speed, M. P. H.	.....	20	20	15	27	16 1/2	.....	14	17	16	14
Clutch Type	Disc	Dry disc	Dry disc	Dry disc	Dry plate	Cone	Dry disc	Cone	Dry plate	Dry disc	Dry disc
Trans. Gearset	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective
Located, Speeds	.....	Unit J, Three	Unit J, Three	Unit M, 4	Unit M, 4	Unit M, three	Unit M, three	Amid., three	Unit M, three	Unit M, three	Unit M, three
Driven by	.....	Double chain	Double chain	Top worm	Top worm	Double chain	Top worm	Chain	Int. gear	Top worm	Double chain
Ratio Gear Red.	.....	7.46-1	.....	8.6-1	.....	7.20-1	.....	6.83-1	7.40-1	7.75-1	7.65-1
Tor. Taken by	Springs	.....	.....	Springs	Springs	Rad. rod	Springs	Radius rod	Springs	Springs	Torque arm
Propelled by	Top worm	Rad. rod	Rad. rod	Springs	Springs	Rad. rod	Springs	Radius rod	Springs	Springs	Radius rod
Springs, For.	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Rear.	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.	144	136	136	140 1/2	130	136	144	134	120	127 1/4, 154, 160 1/4	127 1/4, 154, 160 1/4
Tire Type	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid
Tire Sizes	36x3 1/2, 36x4	36x3 1/2, 36x4	36x3 1/2, 36x4	36x3 1/2, 36x5	36x3 1/2, 36x5	37x3 1/2, 37x5	36x4, 36x4	34x3 1/2, 36x5	36x3 1/2, 35x5	36x3 1/2, 36x5	36x4, 36x5
Driver's Seat	Left	Left	Left	Right	Left	Left	Right	Left	Right	Right	Right
Control Levers	Centre	Centre	Centre	Right	Centre	Centre	Centre	Centre	C-L	Centre	Centre

Abbreviations: Price, \* vehicle complete. Valve location, opp., T head; right or left, L head; R or L and H, side and head; top, horizontal opposed engine; two-cy., two-cycle. Lubrication, spl. pres., splash and pressure; cir. spl., circulating splash; fuel, P. & S., pump and splash. Cooling, thermo, thermo-synphon; cent., centrifugal pump; gear, gear pump. Radiator type, sq.-t. sheet, square or flat tube, sheet metal case; fin. sheet, fin. tube core, cast aluminum case; cell. sheet, cellular core, cast aluminum case; zig-zag tube core, cast case; fin. tube core, cast aluminum case; Z-Z-t. sheet, zig-zag cellular core, sheet metal case; ring cast, copper tube in ring, aluminum tank; sq.-t. cast, square tube core, cast aluminum case; cell. cast, cellular core, cast aluminum case; Z-Z-t. sheet, zig-zag tube core, sheet metal case. Ignition, At-Kt., Atwater Kent; auto, automatic spark advance; auto H, automatic advance, hand adjustment; 2-pt., two-point, fixed, battery circuit retarded, magneto circuit advanced. Clutch Type, exp. shoe, expanding shoe; con. band, contracting band; R, cone, reversed cone. Transmission Gearset, Ind. C, constant mesh individual clutch; Inf, infinite speeds; amid, amidships; unit M, unit with engine; unit J, unit with jackshaft; unit X, unit with axle. Drives by, Int.-g.-f., internal gear, front wheels; double red., double reduction; Int.-g. 4, internal gear, four wheels. Torque Taken by, sub F, sub-frame. Propelled by, springs, rear, springs; sub F, sub-frame.

# MECHANICAL SPECIFICATIONS OF AMERICAN 1916 GASOLINE MOTOR WAGONS AND TRUCKS.

For Manufacturers' Names, Addresses and Other Detail, See General Indices.

## LOAD CAPACITY, 2000 TO 3000 POUNDS.

Make.	Federal	Gabriel	Garford	G. M. C.	Gramm	Hewitt-Ludlow	Hewitt-Ludlow-Horner	Jeffery	Kelly Spring.	Kiebler
Model.	M	M	68	31	3000	3000	F. G.	2016	K 31	A
Capacity.	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Chassis Price.	\$1800	\$1900	\$1800	\$1900	\$2250	\$2150	\$2150	\$1400	\$2050	\$2250
S. A. E. Rating.	27.20	22.50	22.50	22.50	19.61	22.50	22.50	22.50	22.50	27.20
Engine Cyls.	Four	Four	Four	Four	Four	Four	Four	Four	Four	Four
How Cast.	Block	Block	Block	Block	Block	Block	Block	Block	Block	Block
Bore, Stroke.	4 1/2 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2	4 1/2 x 5 1/2
Valve Location.	Left	Right	Right	Right	Right	Right	Left	Right	Left	Left
No. Main Bearings.	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three
Max. R. P. M.	1190	1300	1300	1300	1100	1200	1200	1100	1200	1100
Lubrication.	Oil	Oil	Oil	Oil	Oil	Oil	Oil	Oil	Oil	Oil
Cool. System.	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Thermo	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal
Radiator Type.	Cell. cast	Thin cast	Thin cast	Thin cast	Thin cast	Thin cast	Thin cast	Thin cast	Thin cast	Thin cast
Carburetor.	Stromberg	Rayfield	Rayfield	Rayfield	Rayfield	Rayfield	Rayfield	Rayfield	Rayfield	Rayfield
Ignition.	Make-Elsmann	Elsmann	Elsmann	Elsmann	Elsmann	Elsmann	Elsmann	Elsmann	Elsmann	Elsmann
Type Control.	Single, fixed	Single, hand	Single, hand	Single, hand	Single, hand	Single, hand	Single, hand	Single, fixed	Single, fixed	Single, fixed
Governor Drive.	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor
Speed, M. P. H.	15	15	15	15	17	15	16 1/2	16	15	18
Clutch Type.	Cone	Dry disc	Dry disc	Dry disc	Cone	Cone	Dry disc	Cone	Cone	Wet disc
Trans. Gearset.	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective
Located, Speeds.	Amid., four	Amid., three	Amid., three	Amid., four	Amid., three	Amid., three	Amid., three	Amid., three	Amid., three	Amid., three
Driven by.	Top worm	Top worm	Top worm	Top worm	Top worm	Top worm	Top worm	Top worm	Top worm	Top worm
Ratio Gear Red.	8.50-1	7.75-1	7.75-1	9.06-1	7.75-1	7.75-1	7.75-1	7.5-1	8.60-1	6.50-1
Tor. Taken by.	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod
Propelled by.	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Spring, For.	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.	144	144	144	144	130	126	146	140	120	140
Tire Type.	Solid	Solid	Solid	Solid	Solid	Solid	Solid	P. & S.	Solid	Solid
Tire Sizes.	36x3 1/2, 36x5	36x3 1/2, 36x5	36x3 1/2, 36x5	36x3 1/2, 36x5	36x3 1/2, 36x5	36x3 1/2, 36x5	36x3 1/2, 36x5	36x3 1/2, 36x5	36x3 1/2, 36x5	36x3 1/2, 36x5
Driver's Seat.	Left	Left	Right	Left	Left	Left	Left	Left	Left	Right
Control Levers.	Centre	Centre	Centre	Centre	Centre	Centre	Centre	Centre	Centre	Centre

## LOAD CAPACITY, 2000 TO 3000 POUNDS.

Make.	Lambert	Larrabee	Larrabee	Little Giant	Mack	Modern	Mogul	Moon	Moreland	Netco
Model.	V 3	A	B	H	A H	N	I. M.	R	.....	C
Capacity.	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Chassis Price.	\$1500	\$2000	\$2000	\$1450	\$2600	\$2350	\$1600	\$1650	\$1850	\$2250
S. A. E. Rating.	32.40	27.20	27.20	19.61	25.60	22.50	22.50	22.50	27.20	27.20
Engine Cyls.	Four	Four	Four	Four	Four	Four	Four	Four	Four	Four
How Cast.	Block	Block	Block	Block	Block	Block	Block	Block	Block	Block
Bore, Stroke.	4 1/2 x 4 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	3 3/4 x 5 1/2	4 1/2 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2	3 3/4 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2
Valve Location.	Left	Left	Left	Right	Opposite	Right	Left	L. & H.	Right	Left
No. Main Bearings.	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three
Max. R. P. M.	1500	1300	1200	1200	1150	1100	1200	1000	1120	1200
Lubrication.	Oil	Oil	Oil	Oil	Oil	Oil	Oil	Oil	Oil	Oil
Cool. System.	Centrifugal	Centrifugal	Centrifugal	Thermo	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal
Radiator Type.	Fin. sheet	Fin. cast	Fin. cast	Sq. t. sheet	Cell. sheet	Cell. cast	Cell. cast	Sq. t. sheet	Cell. cast	Fin. cast
Carburetor.	Schebler	Schebler	Schebler	Schebler	Rayfield	Zenith	Cartier	Stromberg	Optional	Zenith
Ignition.	Make-High tension	Elsmann	Elsmann	Elsmann	Elsmann	Elsmann	Elsmann	Rosch	Optional	Elsmann
Type Control.	Dual, hand	Single, hand	Single, hand	Single, fixed	Single, auto.	Single, fixed	Single, fixed	Dual, hand	Single, hand	Single, fixed
Governor Drive.	.....	Motor	Motor	.....	Motor	.....	Motor	.....	.....	D. shaft
Speed, M. P. H.	15	14	14	15	16	15	15	.....	15	15
Clutch Type.	.....	Dry disc	Dry disc	Wet disc	Dry disc	Dry disc	Dry plate	Cone	Dry plate	Dry plate
Trans. Gearset.	Friction	Selective	Selective	Selective	Selective	Selective	Selective	Progressive	Selective	Selective
Located, Speeds.	.....	Unit M, 3	Unit M, 3	Unit M, 3	Unit M, three	Unit M, three	Unit M, three	Unit J, three	Unit M, three	Unit M, three
Driven by.	.....	Top worm	Top worm	Double chain	Top worm	Top worm	Top worm	Top worm	Top worm	Top worm
Ratio Gear Red.	.....	8.66-1	8.66-1	6.88-1	7.75-1	7.75-1	7.75-1	5.62-1	6.75-1	7.50-1
Tor. Taken by.	.....	Spring	Spring	Radius rod	Torsion tube	Spring	Radius rod	Radius rod	Spring	Spring
Propelled by.	.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Spring, For.	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.	120	140	140	110	144	144	125	140	126	144
Tire Type.	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid
Tire Sizes.	36x3 1/2, 36x5	36x3 1/2, 36x5	36x3 1/2, 36x5	37x3 1/2, 37x4	36x4, 36x5	36x3 1/2, 36x5	36x4, 36x5	36x3 1/2, 36x5	36x3 1/2, 36x5	36x3 1/2, 36x5
Driver's Seat.	Left	Left	Left	Right	Left	Right	Left	Left	Right	Left
Control Levers.	Right	Centre	Centre	Centre	Left	.....	Centre	Centre	Centre	Centre

LOAD CAPACITY, 3000 POUNDS.

Make.	Old Reliable	Packard	Paulding E E 1	Sandow	Service Q W	Mignat H	South Head 40	Stegeman G	Sullivan G	Tiffin G W	Universal G	United A S W
Model.	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Capacity.	\$1950	\$2500	\$1600	\$1800	\$2200	\$1750	\$1750	\$1900	\$1600	1800	\$1950	\$1800
Chassis Price.	28	25.50	28	22.50	27.20	25.60	25.60	29.40	22.50	22.50	22.50	28
S. A. E. Rating	Four	Four	Four	Four	Four	Four	Four	Six	Four	Four	Four	Four
Engine Cyls.	Four	Four	Four	Four	Four	Four	Four	Six	Four	Four	Four	Four
How Cast.	Block	Block	Block	Block	Block	Block	Block	Block	Block	Block	Block	Block
How Stroke.	3 1/2 x 5	4 x 5 1/2	4 x 5 1/2	3 1/2 x 5 1/2	4 1/2 x 5 1/2	4 x 5	4 x 5	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5
Valve Location	Left	Right	Right	Left	Left	Left	Left	Left	Left	Left	Right	Right
No. Main Bear.	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three
Max. R. P. M.	1000	1000	1000	1000	1000	1295	1800	1100	1350	1000	1160	2000
Lubrication.	Spl. pres.	Ctr. spl.	Ctr. spl.	Ctr. spl.	Spl. pres.	Ctr. pres.	Ctr. spl.	Spl. pres.	Ctr. pres.	Ctr. spl.	Ctr. spl.	Spl. pres.
Cool. System.	Centrifugal	Thermo	Thermo	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Thermo	Centrifugal	Gear	Centrifugal
Radiator Type.	Fin. cast.	Z-Z-t. sheet	Z-Z-t. sheet	Fin. sheet	Fin. cast.	Fin. cast.	Cell. sheet	Sq.-t. cast	Fin. sheet	Fin. sheet	Fin. cast.	Honeycomb
Carburetor.	Stromberg	Kingston	Kingston	Stromberg	Stromberg	Stromberg	Stromberg	Rayfield	Schebler	Schebler	Optional	Stromberg
Ignition.	Make, Bosch	Dixie	Kingston	Bosch	Eisemann	Eisemann	Eisemann	Westinghouse	Bosch	Bosch	Eisemann	Eisemann
Type, Control.	Single, hand	Dual, hand	Dual, hand	Single, hand	Single, fixed	Single, fixed	Dual, hand	Single, auto.	Single, fixed	Single, fixed	Single, hand	Single, fixed
Governor Drive	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor
Speed, M. P. H.	16	15	15	20	14	15	25	18	18	18 1/2	16	18
Clutch Type.	Dry disc	Dry disc	Dry disc	Dry disc	Dry plate	Dry disc	Wet disc	Dry disc	Cone	Multiple disc	Dry plate	Dry disc
Trans. Gearset	Progressive	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective
Located, Speeds	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, three
Driven by.	Top worm	Int. gear	Top worm	Top worm	Top worm	Top worm	Top worm	Top worm	Double chain	Worm	Top worm	Top worm
Ratio Gear Red.	7.75-1	7.00-1	7.00-1	7.75-1	7.75-1	7.25-1	8.60-1	7.75-1	8.5-1	8-1	7.83-1	7.75-1
Tor. Taken by.	Springs	Springs	Springs	Springs	Springs	Springs	Springs	Springs	Springs	Springs	Torsion arm	Springs
Propelled by.	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod
Springs, For.	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Rear.	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.	138	130	130	150	150	144	130	150	129	138	130	144
Tire Type.	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid
Tire Sizes.	34x3 1/2, 36x4	34x3 1/2, 36x4	34x3 1/2, 36x4	34x3 1/2, 36x4	34x3 1/2, 36x4	34x3 1/2, 36x4	34x3 1/2, 36x4	34x3 1/2, 36x4	34x3 1/2, 36x4	34x3 1/2, 36x4	34x3 1/2, 36x4	34x3 1/2, 36x4
Driver's Seat.	Right	Left	Left	Right	Left	Left	Right	Left	Left	Left	Left	Left
Control Levers	Centre	Centre	Centre	Centre	Centre	Centre	Centre	C. & L.	Centre	Centre	Centre	Centre

LOAD CAPACITY, 3000 POUNDS.

Make.	Velle	White	Wichitr	Wileox	2 Ton Acme	Acme	Armleder	Armleder	Atterbury	Autocar	Available
Model.	25	3000	3000	3000	4000	4000	4000	4000	6-C	21 F	4000
Capacity.	\$2250	\$1800	\$1800	\$1800	\$2100	\$2000	\$2000	\$2000	\$2375	\$1650	\$2000
Chassis Price.	22.50	19.61	19.61	29.00	27.20	27.20	27.20	27.20	27.20	18.10	27.20
S. A. E. Rating	Four	Four	Four	Four	Four	Four	Four	Four	Four	Two	Four
Engine Cyls.	Four	Four	Four	Four	Four	Four	Four	Four	Four	Two	Four
How Cast.	Block	Block	Block	Block	Block	Block	Block	Block	Block	Single	Block
How Stroke.	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2
Valve Location	Left	Right	Right	Right	Left	Left	Left	Left	Left	Right	Left
No. Main Bear.	Three	Two	Two	Three	Three	Three	Three	Three	Three	Two	Three
Max. R. P. M.	1000	1200	1200	1200	1200	1200	1200	1200	1200	1800	1200
Lubrication.	Spl. pres.	Spl. pres.	Spl. pres.	Spl. pres.	Spl. pres.	Spl. pres.	Spl. pres.	Spl. pres.	Ctr. spl.	Splash	Ctr. spl.
Cool. System.	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal
Radiator Type.	Fin. cast.	Cell. sheet	Cell. sheet	Cell. sheet	Fin. cast.	Fin. sheet	Cell. sheet	Cell. sheet	Fin. cast.	Fin. sheet	Fin. sheet
Carburetor.	Stromberg	White	Stromberg	Schebler	Rayfield	Rayfield	Schebler	Schebler	Zenith	Stromberg	Stromberg
Ignition.	Make, Bosch	Bosch	Dixie	Dixie	Eisemann	Eisemann	Eisemann	Eisemann	Bosch	Bosch	Bosch
Type, Control.	Single, hand	Single, hand	Single, hand	Single, hand	Single, fixed	Single, fixed	Single, fixed	Single, fixed	Single, fixed	Single, fixed	Single, fixed
Governor Drive	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor
Speed, M. P. H.	18	15	15	16	12	17	16	16	15	25	15
Clutch Type.	Dry disc	Wet plate	Wet plate	Wet plate	Dry disc	Dry disc	Dry disc	Dry disc	Dry disc	Dry disc	Dry disc
Trans. Gearset	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Progressive	Selective
Located, Speeds	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, 3	Unit M, 3	Unit M, three	Unit M, three	Unit M, four	Unit M, three	Unit M, three
Driven by.	Top worm	Top worm	Top worm	Top worm	Top worm	Top worm	Top worm	Top worm	Top worm	Double red.	Top worm
Ratio Gear Red.	5.80-1	7.70-1	7.70-1	7.70-1	7.75-1	7.75-1	8.00-1	8.00-1	8.50-1	7.10-1	7.75-1
Tor. Taken by.	Springs	Springs	Springs	Springs	Springs	Springs	Springs	Springs	Springs	Springs	Springs
Propelled by.	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod
Springs, For.	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Rear.	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.	150	145 1/2	145 1/2	134	148	148	148	148	153 1/2	97	144
Tire Type.	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid
Tire Sizes.	36x4 1/2, 36x5	36x4 1/2, 36x5	36x4 1/2, 36x5	36x4 1/2, 36x5	36x4 1/2, 36x5	36x4 1/2, 36x5	36x4 1/2, 36x5	36x4 1/2, 36x5	36x4 1/2, 36x5	36x4 1/2, 36x5	36x4 1/2, 36x5
Driver's Seat.	Right	Left	Left	Left	Left	Left	Left	Left	Right	Right	Left
Control Levers	Right	Centre	Centre	Centre	Centre	Centre	Centre	Centre	Right	Right	Centre

LOAD CAPACITY, 4000 POUNDS.

Make.	Velle	White	Wichitr	Wileox	2 Ton Acme	Acme	Armleder	Armleder	Atterbury	Autocar	Available
Model.	25	3000	3000	3000	4000	4000	4000	4000	6-C	21 F	4000
Capacity.	\$2250	\$1800	\$1800	\$1800	\$2100	\$2000	\$2000	\$2000	\$2375	\$1650	\$2000
Chassis Price.	22.50	19.61	19.61	29.00	27.20	27.20	27.20	27.20	27.20	18.10	27.20
S. A. E. Rating	Four	Four	Four	Four	Four	Four	Four	Four	Four	Two	Four
Engine Cyls.	Four	Four	Four	Four	Four	Four	Four	Four	Four	Two	Four
How Cast.	Block	Block	Block	Block	Block	Block	Block	Block	Block	Single	Block
How Stroke.	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2
Valve Location	Left	Right	Right	Right	Left	Left	Left	Left	Left	Right	Left
No. Main Bear.	Three	Two	Two	Three	Three	Three	Three	Three	Three	Two	Three
Max. R. P. M.	1000	1200	1200	1200	1200	1200	1200	1200	1200	1800	1200
Lubrication.	Spl. pres.	Spl. pres.	Spl. pres.	Spl. pres.	Spl. pres.	Spl. pres.	Spl. pres.	Spl. pres.	Ctr. spl.	Splash	Ctr. spl.
Cool. System.	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal
Radiator Type.	Fin. cast.	Cell. sheet	Cell. sheet	Cell. sheet	Fin. cast.	Fin. sheet	Cell. sheet	Cell. sheet	Fin. cast.	Fin. sheet	Fin. sheet
Carburetor.	Stromberg	White	Stromberg	Schebler	Rayfield	Rayfield	Schebler	Schebler	Zenith	Stromberg	Stromberg
Ignition.	Make, Bosch	Bosch	Dixie	Dixie	Eisemann	Eisemann	Eisemann	Eisemann	Bosch	Bosch	Bosch
Type, Control.	Single, hand	Single, hand	Single, hand	Single, hand	Single, fixed	Single, fixed	Single, fixed	Single, fixed	Single, fixed	Single, fixed	Single, fixed
Governor Drive	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor
Speed, M. P. H.	18	15	15	16	12	17	16	16	15	25	15
Clutch Type.	Dry disc	Wet plate	Wet plate	Wet plate	Dry disc	Dry disc	Dry disc	Dry disc	Dry disc	Dry disc	Dry disc
Trans. Gearset	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Progressive	Selective
Located, Speeds	Unit M, three	Unit M, three	Unit M, three	Unit M, three	Unit M, 3	Unit M, 3	Unit M, three	Unit M, three	Unit M, four	Unit M, three	Unit M, three
Driven by.	Top worm	Top worm	Top worm	Top worm	Top worm	Top worm	Top worm	Top worm	Top worm	Double red.	Top worm
Ratio Gear Red.	5.80-1	7.70-1	7.70-1	7.70-1	7.75-1	7.75-1	8.00-1	8.00-1	8.50-1	7.10-1	7.75-1
Tor. Taken by.	Springs	Springs	Springs	Springs	Springs	Springs	Springs	Springs	Springs	Springs	Springs
Propelled by.	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod
Springs, For.	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Rear.	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.	150	145 1/2	145 1/2	134	148	148	148	148	153 1/2	97	144
Tire Type.	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid
Tire Sizes.	36x4 1/2, 36x5	36x4 1/2, 36x5	36x4 1/2, 36x5	36x4 1/2, 36x5	36x4 1/2, 36x5	36x4 1/2, 36x5	36x4 1/2, 36x5	36x4 1/2, 36x5	36x4 1/2, 36x5	36x4 1/2, 36x5	36x4 1/2, 36x5
Driver's Seat.	Right	Left	Left	Left	Left	Left	Left	Left	Right	Right	Left
Control Levers	Right	Centre	Centre	Centre	Centre	Centre	Centre	Centre	Right	Right	Centre

Abbreviations: Price, \* vehicle complete. Valve location, opp., T head; right or left, L head; R or L and H, side and head; top, horizontal; opposed engine; two-cyl., two-cycle. Lubrication, spl. pres., splash and pressure; ctr. spl., circulating splash; fuel, injected with fuel; P. & S., pump and splash. Cooling, thermo, thermo-siphon; cent., centrifugal pump; gear, gear pump. Radiator type, sq.-t. sheet, square or flat tube, sheet metal case; fin. sheet, fin. tube core, cast aluminum case; cell. sheet, cellular core, cast aluminum case; Z-Z-t. sheet, zig-zag tube core, sheet metal case. Ignition, At-Kt., Atwater Kent; auto, automatic spark advance; auto H., automatic advance; hand adjustment, 2-pt., two-point, fixed, battery circuit retarded, magneto circuit advanced. Governor Drive, D, shaft, driving shaft. Clutch Type, exp. shoe, expanding shoe; con. band, contracting band; R, cone, reversed cone. Transmission Gearset, ind. C, constant mesh individual clutch; inf. infinite speeds; unit M, unit with engine; unit J, unit with jackshaft; unit X, unit with axle. Driven by, int.-g.-f., internal gear, front wheels; double red., double reduction; int.-g., 4, internal gear, four wheels. Torque Taken by, sub F, sub-frame. Propelled by, springs, rear springs; sub F, sub-frame.

LOAD CAPACITY, 4000 POUNDS.									
Diamond T	Dorrila	Duplex	Fargo	Federal	Gabriel	Garford	Gary	G. M. C.	
J 3	I B W	E	N	O. and P.	Q	70	H	40	
Model.....	4000	4000	4000	4000	4000	4000	4000	4000	
Capacity.....	\$1990	\$2800	\$1650	\$2100	\$2600	\$2300	29.00	\$2375	
Chassis Price.....	30.65	27.20	22.50	27.20	30	29.50	29.00	27.22	
S. A. E. Rating.....	Four	Four	Four	Four	Four	Four	Four	Four	
Engine Cyls.....	Pairs	Block	Block	Block	Block	Block	Block	Block	
How Cast.....	4 3/4 x 5 1/2	4 3/4 x 5	3 3/4 x 5 1/4	4 1/2 x 5 1/4	4 3/4 x 5 1/2	4 3/4 x 5 1/4	4 3/4 x 5 1/2	4 1/4 x 5 1/4	
More, Stroke.....	Head	Right	Right	Left	Left	Right	.....	Right	
Valve Location.....	Three	Three	Three	Three	Three	Three	.....	Three	
No. Main Bear.....	1085	1240	1100	1030	1200	1000	.....	1200	
Max. R. P. M.....	Clr. spl.	Clr. spl.	Clr. pres.	Clr. spl.	Clr. splash	Clr. spl.	.....	Spl. pres.	
Lubrication.....	Centrifugal	Centrifugal	Thermo	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	
Cool. System.....	Cell. cast.	Fin. sheet	Fin. sheet	Cell. cast	Z-Z-T. sheet	Cell. sheet	.....	Thin cast.	
Radiator Type.....	Stromberg	Schebler	Rayfield	Stromberg	Rayfield	Stromberg	.....	Stromberg	
Carburetor.....	Bosch	Schebler	Bosch	Stromberg	Bosch	Stromberg	.....	Stromberg	
Ignition, Make.....	Dual, hand	Dual, hand	Single, hand	Elsemann	Bosch	Elsemann	.....	Elsemann	
Type, Control.....	Single, fixed	Single	Single, hand	Single, fixed	Single, hand	Single, hand	.....	Single, hand	
Governor Drive.....	Motor	Duplex	Motor	Motor	Motor	Motor	.....	Motor	
Speed, W. P. H.....	15	20	15 1/2	13	15	13 1/2	.....	14	
Clutch Type.....	Dry disc	Dry disc	Dry disc	Cone	Cone	Dry disc	Disc	Dry disc	
Trans. Gearset.....	Selective	Selective	Progressive	Selective	Selective	Selective	Selective	Selective	
Mounted, Speeds.....	Unit M. three	Unit M. eight	Unit M. three	Amid., 3	Amid., 4	Amid., three	.....	Unit M. four	
Driven by.....	Top worm	Int. gear, four	Int. gear	Top worm	Top worm	Top worm	.....	Double chain	
Ratio.....	7.75-1	8.00-1	8.5-1	8.5-1	8.5-1	8.5-1	.....	9.06-1	
Motor.....	Tor. Taken by	Torsion arm	Springs	Springs	Springs	Springs	.....	Springs	
Propelled by.....	Springs	Radius rod	Springs	Radius rod	Springs	Springs	.....	Radius rod	
Springs, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	.....	1/2 elliptic	
Springs, Rear.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	.....	1/2 elliptic	
Wheelbase.....	144 or 162	130	144, 156	O 144, P 168	144 or 168	142	144	158	
Tire Type.....	Solid	Solid	Solid	Solid	Solid	Solid	.....	Solid	
Tire Sizes.....	36x4, 36x4d	36x4, 36x6	36x4, 36x6	36x4, 36x4	36x4, 36x4d	36x4, 36x4d	36x4, 36x4	36x4, 36x4d	
Driver's Seat.....	Right	Left	Left	Left	Right	Right	Left	Left	
Control Levers.....	Centre	Centre	Centre	Centre	Centre	Centre	.....	Centre	





# MECHANICAL SPECIFICATIONS OF AMERICAN 1916 GASOLINE MOTOR WAGONS AND TRUCKS.

**LOAD CAPACITY, 4000 POUNDS.**

**LOAD CAPACITY, 4000 POUNDS.**

[illegible]

# LOAD CAPACITY, 4000 POUNDS.

Make.....	Standard	Sterling	Sullivan	Superior	Thma	T.M.C.	Tower	Transit	Twila City	United	Universal	U. S.
Model.....	70	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
Capacity.....	4000	\$2250	\$2250	\$1800	\$2600	\$2400	\$1600	\$2850	\$2250	\$2250	\$2250	\$2250
Chassis Price.....	\$2000	27.20	27.20	27.20	27.20	27.20	19.61	32.40	19.61	27.20	25.60	27.25
S. A. E. Rating.....	Four	Four	Four	Four	Four	Four	Four	Four	Four	Four	Four	Four
Engine Cyls.....	Four	Four	Four	Four	Four	Four	Four	Four	Four	Four	Four	Four
How Cast.....	Block	Block	Block	Block	Block	Block	Block	Block	Block	Block	Block	Block
Horse, Stroke.....	4x5 1/2	4x5 1/2	4x5 1/2	3x5	4x5 1/2	4x5 1/2	3x5	4x5	3x5	4x5 1/2	4x5 1/2	4x5 1/2
Valve Location.....	Left	Right	Right	Head	Left	Left	Left	Left	Left	Left	Optional	Left
No. Main Bear.....	Three	Three	Three	Three	Three	Three	.....	Three	Five	Three	Three	Three
Max. R. P. M.....	1100	1350	1100	1100	1000	1000	1200	400	1500	1600	1123	1200
Lubrication.....	Clr. spl.	Spl. pres.	Spl. pres.	Clr. spl.	Spl. pres.	Spl. pres.	Clr. spl.	Clr. spl.	Clr. spl.	Spl. pres.	Clr. spl.	Clr. spl.
Radiator Type.....	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Thermo	Sq.-t. sheet	Thermo	Centrifugal	Centrifugal	Centrifugal
Carburetor.....	Flin. sheet	Flin. sheet	Flin. sheet	Cell. sheet	Flin. sheet	Flin. sheet	Sq.-t. sheet	Rayfield	Flin. sheet	Honeycomb	Cell. sheet	Flat tube
Ignition, Make.....	Stromberg	Holley	Holley	Stromberg	Schebler	Schebler	Stromberg	Stromberg	Schebler	Stromberg	Optional	Stromberg
Type, Control.....	Single, auto	Single, fixed	Single, fixed	Single, fixed	Dual, hand	Dual, hand	Bosch	Single, hand	K. W.	Single, fixed	Elsemann	Bosch
Governor Drive.....	Pierce Gov.	Motor	Motor	Automatic	Motor	Motor	.....	Motor	.....	Motor	Motor	Hard and foot
Speed, M. P. H.....	14 1/2	14	15	15	12	12	15	14	15	14	13	15
Clutch Type.....	Cone	Dry disc	Dry disc	Dry disc	Cone	Cone	Dry disc	Wet disc	Dry disc	Dry disc	Cone	Cone
Trans. Gearset.....	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Progressive	Selective	Selective	Ind. clutch
Located, Speeds.....	Amid., three	Unit M, three	Unit M, three	Unit M, three	Amid., three	Amid., three	Unit M, three	Unit J, three	Unit J, three	Unit M, three	Amid., three	Amid., 3
Driven by.....	Top worm	Top worm	Top worm	Int. gear	Top worm	Top worm	Top worm	Double chain	Double chain	Top worm	Double chain	Slide chains
Ratio Gear Red.....	7.75-1	8.50-1	8.50-1	8.00-1	8.80-1	8.80-1	8.75-1	9.00-1	10.00-1	8.65-1	9.25-1	8.16-1
Tor. Taken by.....	Springs	Springs	Springs	Springs	Springs	Springs	Springs	.....	.....	Springs	Radius rod	.....
Propelled by.....	Radius rod	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	Radius rod	Radius rod	1/2 elliptic	Radius rod	Radius rods
Springs, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Rear.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.....	140, 164	140	140	144	140	140	135	144	104	144 or 168	132	132
Tire Type.....	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid
Tire Size.....	36x4, 36x4d	36x4, 36x6	36x4, 36x6	36x4, 36x6	36x4, 36x3 1/2 d	36x4, 36x3 1/2 d	34x3 1/2, 34x3 1/2 d	36x4d	34x3, 36x3 1/2	36x4, 36x4d	36x4, 36x4d	34x3 1/2, 36x3 1/2 d
Driver's Seat.....	Left	Left	Left	Left	Left	Left	Left	Right	Right	Left	Left	R. & L.
Control Levers.....	Centre	Centre	Centre	Centre	Centre	Centre	Centre	Right	Right	Centre	Centre	Centre

# LOAD CAPACITY, 4000 POUNDS.

Make.....	U. S.	Wichita	Wichita	Wilson	W.D. 2	Zettler & Lamm	Adams	Armleder	Barker
Model.....	H	4000	4000	4000	4000	4000	4000	4000	5000
Capacity.....	4000	\$2100	\$2100	\$2200	\$2250	\$2000	\$2500	\$2800	\$1750
Chassis Price.....	\$2500	19.61	19.61	27.25	27.20	27.25	27.20	27.20	25.60
S. A. E. Rating.....	Four	Four	Four	Four	Four	Four	Four	Four	Four
Engine Cyls.....	Four	Block	Block	Block	Block	Block	Block	Block	Block
How Cast.....	Block	3 1/2 x 5	3 1/2 x 5	4 1/2 x 5	4 1/2 x 5	4 1/2 x 5	4 1/2 x 5	4 1/2 x 5	4x5
Horse, Stroke.....	4 1/2 x 5 1/2	4.12, 7	4.12, 7	4 1/2 x 5	4 1/2 x 5	4 1/2 x 5	4 1/2 x 5	4 1/2 x 5	4x5
Valve Location.....	Left	Left	Left	Right	Left	Left	Right	Left	Left
No. Main Bear.....	Three	Two	Two	Three	Three	.....	Three	Three	Three
Max. R. P. M.....	1200	1050	1250	1200	1085	.....	2200	1600	1500
Lubrication.....	Clr. spl.	Spl. pres.	Spl. pres.	Clr. spl.	Clr. spl.	Spl. pres.	Clr. spl.	Clr. spl.	Spl. pres.
Radiator Type.....	Centrifugal	Thermo	Thermo	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Thermo
Carburetor.....	Flin. sheet	Cell. sheet	Cell. sheet	Flin. cast	Flin. cast	Cell. sheet	Flin. sheet	Cell. sheet	Cell. sheet
Ignition, Make.....	Stromberg	Stromberg	Stromberg	Marvel	Zenith	Stromberg	Zenith	Schebler	Stromberg
Type, Control.....	Single, hand	Single, hand	Single, hand	Single, fixed	Single, auto	Hand	Elsemann	Bosch	Elsemann
Governor Drive.....	Motor	Motor	Motor	Motor	Motor	.....	Single, auto	Single, hand	Single, auto
Speed, M. P. H.....	15	13	13	15	15	.....	18	14	20
Clutch Type.....	Cone	Cone	Cone	Cone	Dry disc	Dry disc	Dry disc	Dry disc	Dry plate
Trans. Gearset.....	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective
Located, Speeds.....	Amid., three	Unit J, three	Unit J, three	Unit J, three	Unit M, three	Unit M, three	Unit J, Three	Unit M, three	Unit M, 4
Driven by.....	Top worm	Double chain	Double chain	Top worm	Top worm	Top worm	Double chain	Double chain	Top worm
Ratio Gear Red.....	8.68-1	8.24-1	8.24-1	8.7	7.75-1	.....	8.40-1	9.00-1	.....
Tor. Taken by.....	Springs	Radius rod	Radius rod	Springs	Springs	Springs	.....	.....	Springs
Propelled by.....	Springs	1/2 elliptic	1/2 elliptic	Springs	Springs	Springs	Rad. rod	Rad. rod	Springs
Springs, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Rear.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.....	144	118	118	150	144	154	140	148	136
Tire Type.....	Solid	Solid	Solid	Optional	Solid	Solid	Solid	Solid	Solid
Tire Size.....	36x4, 36x5	36x4 1/2, 34x3d	36x3 1/2, 36x3d	36x4, 36x3 1/2 d	36x4, 36x4d	36x3 1/2, 36x3 1/2 d	36x4, 36x4d	36x4, 36x4d	36x4, 36x7
Driver's Seat.....	Left	Right	Right	Left	Left	Left	Left	Left	Left
Control Levers.....	Centre	Centre	Centre	Centre	Centre	Centre	Centre	Centre	Centre

# LOAD CAPACITY, 5000 POUNDS.

Abbreviations: Price, \* vehicle complete. Valve location, opp., T head; right or left, L head; R or L and H, side and head; top, horizontal opposed engine; two-cy., two-cycle. Lubrication, spl. pres., splash and pressure; clr. spl., circulating splash; fuel, injected with fuel; P. & S., pump and splash. Cooling, thermo, thermo-siphon; cent., centrifugal pump; gear, gear pump. Radiator type, sq.-t. sheet, square or flat tube, sheet metal case; fin. sheet, fin. tube core, sheet metal case; Z-Z-t, zig-zag tube core, cast case; fin. cast, fin. tube core, cast aluminum case; cell. sheet, cellular core, sheet metal case; ring cast, copper tube in ring, aluminum tank; sq.-t. cast, square tube core, cast aluminum case; cell. cast, cellular core, cast aluminum case; Z-Z-t sheet, zig-zag tube core, sheet metal case. Ignition, At.-Kt., Atwater Kent; auto, automatic spark advance; auto H, automatic advance, hand adjustment; 2-pt., two-point, fixed, battery circuit retarded, magneto circuit advanced. Governor Drive, D, shaft, driving shaft; Clutch Type, exp. shoe, expanding shoe; con. band, contracting band; R, cone, reversed cone. Transmission Gearset, Ind. C., constant mesh individual clutch; Inf, infinite speeds; amid, amidships; unit M, unit with engine; unit J, unit with jackshaft; unit X, unit with axle. Driven by, Int.-G.-C., internal gear, front wheels; double red., double reduction; Int.-G. 4, internal gear, rear springs; sub F, sub-frame. Propelled by, springs, rear springs; sub F, sub-frame.

**LOAD CAPACITY, 5000 POUNDS.**

**LOAD CAPACITY, 5000 POUNDS.**

**LOAD CAPACITY, 6000 POUNDS.**

LOAD CAPACITY, 6000 POUNDS.

Make.....	Model.....	Capacity.....	Chassis Price.....	S. A. E. Rating.....	Engine Cyls.....	How Cast.....	Bore, Stroke.....	Valve Location.....	No. Main Hear.....	Max. R. P. M.....	Lubrication.....	Cool. System.....	Radiator Type.....	Carburetor.....	Ignition.....	Type, Control.....	Governor Drive.....	Speed, M. P. H.....	Clutch Type.....	Trans. Gearset.....	Located, Speeds.....	Driven by.....	Ratio Gear Red.....	Tor. Taken by.....	Propelled by.....	Springs, For.....	Springs, Rear.....	Wheelbase.....	Tire Type.....	Tire Sizes.....	Driver's Seat.....	Control Levers.....	
Blair.....	2 D.....	6000.....	\$3250.....	32.4.....	Four.....	Pairs.....	4 1/2 x 5 1/2.....	Opposite.....	Three.....	1100.....	Clir. spl.....	Centrifugal.....	Fin. cast.....	Schebler.....	Bosch.....	Single, hand.....	Motor.....	12.....	Wet disc.....	Selective.....	Unit J, three.....	Double chain.....	13.00-1.....	Springs.....	Rad. rod.....	Elliptic.....	Platform.....	138.....	Solid.....	36x5, 36x5d.....	Right.....	Right.....	
Coleman.....	H.....	6000.....	\$2750.....	32.4.....	Four.....	Pairs.....	4 1/2 x 5 1/2.....	Opposite.....	Three.....	1000.....	Pressure.....	Centrifugal.....	Fin. cast.....	Schebler.....	Bosch.....	Single, hand.....	Motor.....	12.....	Cone.....	Selective.....	Unit J, three.....	Double chain.....	.....	.....	.....	Rad. rod.....	Elliptic.....	Platform.....	138.....	Solid.....	36x5, 36x5d.....	Right.....	Right.....
Corbett.....	D.....	6000.....	\$2750.....	32.4.....	Four.....	Pairs.....	4 1/2 x 5 1/2.....	Opposite.....	Three.....	1100.....	Clir. spl.....	Centrifugal.....	Fin. cast.....	Schebler.....	Bosch.....	Single, hand.....	Duplex.....	10.....	Dry disc.....	Selective.....	Unit M, four.....	Int. gear, four.....	8.00-1.....	Torsion arm.....	Radius rod.....	1/2 elliptic.....	1/2 elliptic.....	130.....	Solid.....	36x5, 36x5d.....	Left.....	Centre.....	
Duplex.....	D.....	6000.....	\$3300.....	29.00.....	Four.....	Pairs.....	4 1/2 x 5 1/2.....	Opposite.....	Three.....	1250.....	Clir. spl.....	Centrifugal.....	Fin. cast.....	Schebler.....	Bosch.....	Single, hand.....	Duplex.....	10.....	Dry disc.....	Selective.....	Unit M, four.....	Int. gear, four.....	8.00-1.....	Torsion arm.....	Radius rod.....	1/2 elliptic.....	1/2 elliptic.....	130.....	Solid.....	36x5, 36x5d.....	Left.....	Centre.....	
Hoover.....	F. G.....	6000.....	\$4000.....	32.40.....	Four.....	Pairs.....	4 1/2 x 5 1/2.....	Opposite.....	Three.....	1100.....	Spl. pres.....	Centrifugal.....	Fin. cast.....	Stromberg.....	Bosch.....	Single, hand.....	Motor.....	14.....	Wet disc.....	Selective.....	Unit M, three.....	Top worm.....	8.90-1.....	Springs.....	Radius rod.....	1/2 elliptic.....	Platform.....	145.....	Solid.....	36x5, 40x4d.....	Left.....	Centre.....	
Indiana.....	R.....	6000.....	\$2750.....	32.40.....	Four.....	Pairs.....	4 1/2 x 5 1/2.....	Opposite.....	Three.....	1200.....	Spl. pres.....	Centrifugal.....	Fin. cast.....	Stromberg.....	Bosch.....	Single, hand.....	Motor.....	14 1/2.....	Dry plate.....	Selective.....	Unit M, three.....	Top worm.....	8.70-1.....	Springs.....	Radius rod.....	1/2 elliptic.....	1/2 elliptic.....	136.....	Solid.....	36x5, 36x5d.....	Left.....	Centre.....	
Kieselkar.....	R.....	6000.....	\$2750.....	32.40.....	Four.....	Pairs.....	4 1/2 x 5 1/2.....	Opposite.....	Three.....	1250.....	Clir. spl.....	Centrifugal.....	Sq.-t. sheet.....	Stromberg.....	Elsemann.....	Single, hand.....	Motor.....	13.....	Cone.....	Selective.....	Unit J, four.....	Double chain.....	9.90-1.....	.....	Radius rod.....	1/2 elliptic.....	1/2 elliptic.....	144.....	Solid.....	36x4, 38x4.....	Left.....	Centre.....	
Main.....	R. L. H.....	6000.....	\$2750.....	32.40.....	Four.....	Pairs.....	4 1/2 x 5 1/2.....	Opposite.....	Three.....	1250.....	Clir. spl.....	Centrifugal.....	Cell. sheet.....	Rayfield.....	Elsemann.....	Single, auto.....	Gear set.....	12.....	Exp. S.....	Progressive.....	Unit M, three.....	Int. gear.....	5.60-1.....	Torsion tube.....	Radius rod.....	1/2 elliptic.....	1/2 elliptic.....	132.....	Solid.....	36x5, 36x5d.....	Left.....	Left.....	
Morton.....	R.....	6000.....	\$2750.....	32.40.....	Four.....	Pairs.....	4 1/2 x 5 1/2.....	Opposite.....	Three.....	1250.....	Pressure.....	Centrifugal.....	Cell. sheet.....	Carter.....	Dixie.....	Dual, hand.....	Motor.....	25 1/2.....	Wet disc.....	Selective.....	Unit M, three.....	Top worm, 4.....	5.60-1.....	Springs.....	Radius rod.....	1/2 elliptic.....	1/2 elliptic.....	112.....	Solid.....	40x6, 40x6.....	Right.....	Right.....	
Nel & Le Moon Packard.....	R. S.....	6000.....	\$2750.....	32.40.....	Four.....	Pairs.....	4 1/2 x 5 1/2.....	Opposite.....	Three.....	1000.....	Clir. spl.....	Centrifugal.....	Sq.-t. sheet.....	Rayfield.....	Dixie.....	Dual, hand.....	Motor.....	12.....	Dry disc.....	Selective.....	Unit M, three.....	Top worm.....	8.75-1.....	.....	.....	.....	1/2 elliptic.....	1/2 elliptic.....	156 or 174.....	Solid.....	36x5, 36x5d.....	Left.....	Left.....

LOAD CAPACITY, 6000 POUNDS.

Make.....	Republie	Riker	Rowe	Sandow	G. A. Schacht	Universal	U. S.	Volts	White	Wisconsin
Model.....	T	B	D F W	.....	3-Ton	A	O	E	T A D	B
Capacity.....	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
Chassis Price.....	\$2550	\$3500	\$3400	\$2500	\$3200	\$3400	\$2700	\$2750	\$2750	\$2275
S. A. E. Rating.....	29.00	29.00	29.00	32.40	29.00	25.60	32.4	32.40	22.50	25.60
Engine Cyls.....	Four	Four	Four	Four	Four	Four	Four	Four	Four	Four
How Cast.....	Block	Pairs	Pairs	Pairs	Block	Pairs	Pairs	Pairs	Block	Pairs
Bore, Stroke.....	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	3 3/4 x 5 1/2	4 1/2 x 5 1/2
Valve Location.....	Opposite	Opposite	Opposite	Left	It. & H.	Opposite	Left	Left	Right	Right
No. Main Bear.....	Three	Five	Three	Three	Three	Three	Three	Three	Two	Three
Max. R. P. M.....	1100	1180	1000	1000	1000	1057	1190	1000	.....	.....
Lubrication.....	Spl. pres.	Spl. pres.	Pressure	Clir. spl.	Spl. pres.	Clir. spl.	Clir. spl.	Centrifugal	Spl. pres.	Spl. pres.
Cool. System.....	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal
Radiator Type.....	Fin. sheet	Tubular	Sq-t. sheet	Cell. sheet	Cell. sheet	Cell. sheet	Sq-t. cast	Cell. sheet	White	Cell. cast
Carburetor.....	Stromberg	Stromberg	Rivfield	Stromberg	Schebler	Optional	Stromberg	Rayfield	White	.....
Ignition.....	Bosch	Elsemann	Bosch	Bosch	Bosch	Elsemann	Bosch	Elsemann	Bosch	Elsemann
Type, Control.....	Single, hand	Dual, hand	Single	Single, hand	Single, hand	Dual, hand	Dual, auto	Dual, auto	Single, hand	.....
Governor Drive.....	Suction	Motor	Motor	Motor	Motor	Motor	Motor	Motor	.....	.....
Speed, M. P. H.....	11	14 1/2	.....	12	12	10 1/2	15	15	.....	15
Clutch Type.....	Dry disc	Cone	.....	Dry disc	Cone	Cone	Cone	Wet disc	Wet plate	Cone
Trans. Gearset.....	Selective	Selective	Selective	Selective	Selective	Selective	Ind. C.	Selective	Selective	.....
Located, Speeds.....	Unit M, four	Amid., four	Amid., four	Unit M, three	Amid., three	Unit J, three	Amid., 3	Unit J, three	Amid., four	Centre
Driven by.....	Int. gear	Top worm	Top worm	Double chain	Top worm	Double chain	Double chain	Double chain	Double chain	Top worm
Ratio Gear Red.....	10-1, optional	8.75-1	.....	7.00-1	9.67 or 10.33	10.33-1	8.01-1	6.60-1	.....	.....
Tor. Taken by.....	Springs	Torsion arm	Springs	Springs	Torsion tube	Radius rod	Radius rod	Radius rod	.....	.....
Propelled by.....	Radius rod	Radius rod	Radius rod	Springs	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Springs
Springs, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Rear.....	1/2 elliptic	1/2 elliptic	156	186	Platform	132	144	Platform	163	166
Wheelbase.....	151	150	.....	186	168	132	144	142	163	166
Tire Type.....	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid
Tire Sizes.....	36x5, 36x5d	36x5, 36x5d	36x5, 36x5d	36x5, 36x5d	38x4, 38x5d	36x5, 36x5d	34x5, 26x5	36x5, 38x5d	36x5, 40x5d	36x4, 36x4
Driver's Seat.....	Left	Right	Left	Right	Left	Left	R. & L.	Left	Left	Left
Control Levers.....	Centre	Right	Centre	Centre	Centre	.....	Centre	Centre	C. & L.	Centre

Abbreviations: Price, \*, vehicle complete. Valve location, opp., T head; right or left, L head; R or L and H, side and head; top, horizontal opposed engine; two-cy., two-cycle. Lubrication, spl. pres., splash and pressure; clir. spl., circulating splash; fuel, injected with fuel; P. & S. pump and splash. Cooling, thermo. thermo-siphon; cent., centrifugal pump; gear, gear pump. Radiator type, sq.-t. sheet, square or flat tube, sheet metal case; fin. sheet, fin. tube core, sheet metal case; Z-Z-t. cast, zig-zag tube core, cast aluminum case; cell. sheet, cellular core, sheet metal case; ring cast, copper tube in ring, aluminum tank; sq.-t. cast, square tube core, cast aluminum case; cell. cast, cellular core, cast aluminum case; Z-Z-t. sheet, zig-zag tube core, sheet metal case. Ignition, At.-Kt., Alwater Kent; auto, automatic spark advance; auto H, automatic advance, hand adjustment; 2-pt., two-point, fixed, battery circuit retarded, magneto circuit advanced. Governor Drive, D. shaft, driving shaft. Clutch Type, exp. shoe, expanding shoe; con. band, contracting band; R. cone, reversed cone. Transmission Gearset, Ind. C., constant mesh individual clutch; inf. infinite speeds; amid. amidships; unit M, unit with engine; unit X, unit with jackshaft; unit Y, sub-frame. Driven by, int.-g.-f., internal gear, front wheels; int.-g. double reduction; int.-g. 4, internal gear, four springs; sub F, sub-frame. Propelled by, springs, rear springs; sub F, sub-frame.

Abbreviations: Price, \* vehicle complete. Valve location, opp., T head; right or left, L head; R or L and H, side and head; top, horizontal opposed engine; two-cy., two-cycle. Lubrication, spl. pres., splash and pressure; clir. spl., circulating splash; fuel, fuel-injected with fuel; P. & S. pump and a splash. Coolant, thermo-siphon; cent., centrifugal pump; gear, gear pump. Radiator type, sq-t. sheet, square or flat tube, sheet metal case; fin. tube core, sheet metal case; Z-Z-t. cast, zig-zag tube core, cast aluminum case; cell. cast, cellular core, sheet metal case; Z-Z-t. sheet, zig-zag tube core, sheet metal case; Ignition, At.-Kt., Atwater Kent; auto, automatic spark advance; auto H, automatic advance; hand adjustment; 2-pt., two-point, fixed, battery circuit retarded, magneto circuit advanced. Governor Drive, D, shaft, driving shaft; Clutch Type, exp. shoe, expanding shoe; con band, contracting band; R, cone, reversed cone. Transmission Gearset, ind. C, constant mesh individual clutch; Inf. Infinite speeds; amid, amidships; unit J, unit with engine; unit X, unit with axle. Drives by, Int.-G.-f., internal gear, front wheels; double red., double reduction; Int.-G.-f., internal gear, rear springs; sub F, sub-frame. Propelled by, springs, rear springs; sub F, sub-frame.

# MECHANICAL SPECIFICATIONS OF AMERICAN 1916 GASOLINE MOTOR WAGONS AND TRUCKS.

For Manufacturers' Names, Addresses and Other Detail, See General Indices.

## LOAD CAPACITY, 7000 POUNDS.

Make	Armleder	Atterbury	Available	Bearner	Burford	C-T	Continental (C)	Dayton	Diamond T
Model	H W	6-D	.....	E	D	Gen. Elec.	C D 3 1/2	A	L
Capacity	7000	7000	7000	7000	7000	7000	7000	7000	7000
Chassis Price	\$3500	\$3175	\$3000	\$2500	\$3450	\$4800	\$3000	\$3400	\$3300
S. A. E. Rating	28.90	32.40	32.40	32.40	32.40	32.40	32.40	32.40	32.40
Engine Cyls	Four	Four	Four	Four	Four	Four	Four	Four	Four
How Cast	Pairs	Pairs	Pairs	Pairs	Block	Pairs	Pairs	Pairs	Pairs
Bore, Stroke	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 6 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2
Valve Location	Left	Left	Left	Right	Left	Opposite	Single	Opposite	Left
No. Main Bear.	Three	Three	Three	Three	Three	Three	Three	Three	Three
Max. R. P. M.	1200	1125	1200	1090	1100	1150	1150	1000	.....
Lubrication	Cl. spl.	Cl. spl.	Cl. spl.	Cl. spl.	Spl. pres.	Pressure	Cl. spl.	Cl. spl.	Cl. spl.
Cool. System	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal
Radiator Type	Fin. cast.	Fin. cast.	Fin. cast.	Fin. cast.	Fin. cast.	Fin. cast.	Fin. cast.	Fin. cast.	Sq.-t. sheet
Carburetor	Schebler	Zenith	Stromberg	Rayfield	Zenith	Stromberg	Stromberg	Stromberg	Rayfield
Ignition	Bosch	Bosch	Bosch	Bosch	Elsemann	Bosch	Elsemann	Bosch	Bosch
Type, Control	Single, hand	Double, hand	Dual, fixed	Single, hand	Single, fixed	Single, 2 pt.	Single, fixed	Dual, hand	Single, hand
Governor Drive	.....	Motor	Motor	Motor	Motor	Motor	Motor	Duplex	Motor
Speed, M. P. H.	13	13	14	13	13	12	18	15	13
Clutch Type	Dry disc	Dry disc	Dry disc	Cone	Cone	.....	Dry disc	Wet disc	Dry disc
Trans. Gearset	Selective	Selective	Selective	Selective	Selective	.....	Selective	Selective	Selective
Located, Speeds	Unit M, three	Unit M, four	Unit M, three	Unit M, four	Unit M, four	Unit M, two	Unit M, three	Unit J, three	Unit M, four
Driven by	Top worm	Top worm	Top worm	Top worm	Top worm	Int.-G.-4	Revel, four	Double chain	Top worm
Ratio Gear Red.	10.33-1	10.30-1	10.33-1	10.33-1	8.75-1	7.32-1	25.00-1	9.40-1	8.75-1
Tor. Taken by	Springs	Springs	Springs	Springs	Springs	Springs	Rad. rod	Rad. rod	Springs
Propelled, For	Rad. rod	Rad. rod	Rad. rod	Rad. rod	Rad. rod	Rad. rod	Rad. rod	Rad. rod	Rad. rod
Springs, Rear	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Front	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase	156	167 1/2	150	150	175	132	168 or 204	136	164
Tire Type	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid
Tire Sizes	36x5, 36x5d	36x5, 40x5d	36x5, 40x5d	36x5, 37x5d	36x5, 36x5d	36x4d, 36x4d	36x5, 36x5d	36x5, 36x4d	36x5, 36x5d
Driver's Seat	Left	Right	Left	Left	Right	Left	Left	Left	Right
Control Levers	Centre	Right	Centre	Centre	Right	Centre	Centre	Centre	Centre

## LOAD CAPACITY, 7000 POUNDS.

Make	Garford	G M C	G. M. C.	Gramm	Hall	Harvey	Kelly Spring	Kling	Kleiber	Kluekerbocker
Model	77	70	71	.....	.....	W. H.	K 40	.....	C 3 1/2	18
Capacity	7000	7000	7000	7000	7000	7000	7000	7000	7000	7000
Chassis Price	\$3400	\$3300	\$3500	\$3400	\$2800	\$2950	\$3400	\$1600	\$3500	\$2850
S. A. E. Rating	32.40	32.40	32.40	32.40	32.40	29.00	32.40	32.40	32.40	32.40
Engine Cyls	Four	Four	Four	Four	Four	Four	Four	Four	Four	Four
How Cast	Pairs	Pairs	Pairs	Pairs	Pairs	Block	Pairs	Pairs	Pairs	Pairs
Bore, Stroke	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5
Valve Location	Left	Left	Left	Left	Left	Right	Opposite	Left	Left	Left
No. Main Bear.	Three	Three	Three	Three	Five	Three	Three	Three	Three	Three
Max. R. P. M.	1100	1100	1210	1100	1150	1000	1000	1000	1200	1000
Lubrication	Cl. spl.	Spl. pres.	Spl. pres.	Cl. spl.	Cl. spl.	Spl. pres.	Pressure	Spl. pres.	Spl. pres.	Spl. pres.
Cool. System	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal
Radiator Type	Cell. cast	Fin. cast.	Fin. cast.	Fin. cast.	Fin. cast.	Sq.-t. sheet	Sq.-t. sheet	Fin. cast.	Fin. cast.	Fin. cast.
Carburetor	Rayfield	Marvel	Marvel	Zenith	Zenith	Holley	Rayfield	Schebler	Schebler	Stromberg
Ignition	Dixie	Elsemann	Elsemann	Elsemann	Bosch	Elsemann	Elsemann	Bosch	Bosch	Bosch
Type, Control	Single, hand	Single, hand	Single, hand	Single, hand	Single, auto.	Single, auto.	Single, auto.	Dual, 2 pt.	Dual, hand	Single, hand
Governor Drive	Motor	Motor	Motor	Motor	Motor	Duplex	Motor	Motor	Motor	Motor
Speed, M. P. H.	8	12	12	12	15	13	10.5	12	14	12
Clutch Type	Dry disc	Dry disc	Dry disc	Dry disc	Dry disc	Cone	Cone	Dry disc	Wet disc	Dry disc
Trans. Gearset	Selective	Selective	Selective	Progressive	Progressive	Selective	Selective	Selective	Selective	Selective
Located, Speeds	Unit J, 4	Unit J, 4	Unit J, 4	Unit M, four	Unit M, four	Unit J, three	Unit J, three	Unit J, three	Unit M, three	Unit M, three
Driven by	Top worm	Double chain	Top worm	Top worm	Top worm	Double chain	Double chain	Double chain	Top worm	Top worm
Ratio Gear Red.	10.33-1	10.90-1	12.00-1	11.75-1	.....	8.75-1	10.5-1	8.62-1	8.75-1	10.33-1
Tor. Taken by	Springs	Springs	Springs	Springs	Springs	Springs	Radius rod	Radius rod	Springs	Springs
Propelled, For	Radius rods	Radius rods	Radius rods	Radius rods	Radius rods	Radius rods	Radius rod	Radius rod	Radius rod	Radius rod
Springs, Front	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Rear	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase	128	163	163	168	144	168	150	120	160	164
Tire Type	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid
Tire Sizes	36x5, 40x5	36x5, 40x5d	36x5, 40x5d	36x5, 40x5d	36x5, 40x5d	36x5, 36x5d	36x5, 36x5d	36x5, 36x5d	36x5, 36x5d	36x5, 36x5d
Driver's Seat	Right	Left	Left	Left	Left	Left	Left	Right	Right	Left
Control Levers	Centre	Centre	Centre	Centre	Centre	Centre	Centre	Right	Centre	Centre





**LOAD CAPACITY, 10,000 POUNDS.**

**LOAD CAPACITY, 10,000 POUNDS.**

[illegible]

	i. M. C.	G. M. C.	Hall	H
...				

<b>F</b>	<b>L</b>	<b>K 50</b>	<b>D</b>
10 000	10 000	10 000	10 000

[illegible]

44.20	Four
36.19	Four
32.18	Four
28.17	Four
24.16	Four
20.15	Four
16.14	Four
12.13	Four
8.12	Four
4.11	Four

Pairs		Pairs	
$1\frac{1}{2} \times 6\frac{1}{2}$		$1\frac{1}{2} \times 5\frac{1}{2}$	
13		13	
4		4	

Opposite Three	Opposite Three	Opposite Three
-------------------	-------------------	-------------------

[illegible]

Spl. pres.  
Centrifugal

Spl. pres.  
Centrifugal

Spl. pres.  
Centrifugal

Thin cast.	Fin. cast.	Fin. cast.	S.
Marvel	Marvel	Zenith	H

Bosch	Bosch	Elsemann	Bosch
Dual. hand	Single. hand	Single. auto.	Dual. hand

Motor	Motor	Motor
10	10	19

	Dry disc	Dry plate	Cone	Wet disc
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00
31	0.00	0.00	0.00	0.00
32	0.00	0.00	0.00	0.00
33	0.00	0.00	0.00	0.00
34	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00
36	0.00	0.00	0.00	0.00
37	0.00	0.00	0.00	0.00
38	0.00	0.00	0.00	0.00
39	0.00	0.00	0.00	0.00
40	0.00	0.00	0.00	0.00
41	0.00	0.00	0.00	0.00
42	0.00	0.00	0.00	0.00
43	0.00	0.00	0.00	0.00
44	0.00	0.00	0.00	0.00
45	0.00	0.00	0.00	0.00
46	0.00	0.00	0.00	0.00
47	0.00	0.00	0.00	0.00
48	0.00	0.00	0.00	0.00
49	0.00	0.00	0.00	0.00
50	0.00	0.00	0.00	0.00
51	0.00	0.00	0.00	0.00
52	0.00	0.00	0.00	0.00
53	0.00	0.00	0.00	0.00
54	0.00	0.00	0.00	0.00
55	0.00	0.00	0.00	0.00
56	0.00	0.00	0.00	0.00
57	0.00	0.00	0.00	0.00
58	0.00	0.00	0.00	0.00
59	0.00	0.00	0.00	0.00
60	0.00	0.00	0.00	0.00
61	0.00	0.00	0.00	0.00
62	0.00	0.00	0.00	0.00
63	0.00	0.00	0.00	0.00
64	0.00	0.00	0.00	0.00
65	0.00	0.00	0.00	0.00
66	0.00	0.00	0.00	0.00
67	0.00	0.00	0.00	0.00
68	0.00	0.00	0.00	0.00
69	0.00	0.00	0.00	0.00
70	0.00	0.00	0.00	0.00
71	0.00	0.00	0.00	0.00
72	0.00	0.00	0.00	0.00
73	0.00	0.00	0.00	0.00
74	0.00	0.00		

Unit	Selective	Progressive
Unit M.	four	four
Unit A.	four	four

double chain	Top worm	Double chain	Top worm
13.40-1	11.75-1	12.00-1	8.75-1

.....	.....
Springs	Springs
Radius rod	Radius rod

[illegible]

$\frac{1}{2}$ empty	$\frac{1}{2}$ empty
163	163
163	134
163	163

<b>Solid</b>	<b>Solid</b>	<b>Solid</b>
<b>38x6, 42x6d</b>	<b>36x5, 40x5d</b>	<b>36x6, 40x6d</b>

Left	Left	Left
Centre	Centre	Centre
Right	Right	Right

**CONCLUSIONS**



## MECHANICAL SPECIFICATIONS OF AMERICAN 1916 GASOLINE MOTOR WAGONS AND TRUCKS.

For Manufacturers' Names, Addresses and Other Detail, See General Indices.

## LOAD CAPACITY, 10,000 POUNDS.

Make.....	White	Donner	Garford	Gramm	G. V. Mercedes	Kelly Spring	Klinefelter	Old Reliable	Peerless	Royal	Tiffin
Model.....	1916	F	F	F	F. V.	K 60	Klinefelter	K 60	T C 6	A 6	S W
Capacity.....	11,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000
Chassis Price.....	\$4500	\$4500	\$4500	\$4500	\$4500	\$4500	\$4500	\$4500	\$4500	\$4500	\$4500
S. A. E. Rating.....	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00
Engine Cyls.....	Four	Four	Four	Four	Four	Four	Four	Four	Four	Four	Six
How Cast.....	Block	Block	Block	Block	Block	Block	Block	Block	Block	Block	Block
Bore, Stroke.....	4 1/2 x 6 1/2	4 1/2 x 6 1/2	4 1/2 x 6 1/2	4 1/2 x 6 1/2	4 1/2 x 6 1/2	4 1/2 x 6 1/2	4 1/2 x 6 1/2	4 1/2 x 6 1/2	4 1/2 x 6 1/2	4 1/2 x 6 1/2	3 1/2 x 5 1/2
Valve Location.....	Right	Left	Left	Left	Head	Opposite	Left	Left	Opposite	Opposite	Right
No. Main Bearings.....	Three	Three	Three	Three	Four	Three	Three	Three	Three	Three	Three
Max. R. P. M.....	1000	1000	1000	1000	850	1000	1160	750	.....	900	1000
Lubrication.....	Spl. pres.	Centrifugal	Centrifugal	Centrifugal	Spl. pres.	Pressure	Centrifugal	Centrifugal	Spl. pres.	Pressure	Spl. pres.
Radiator Type.....	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal
Carburetor.....	Sq.-t. sheet	Fin. cast.	Fin. cast.	Fin. cast.	Fin. cast.	Fin. cast.	Fin. cast.	Fin. cast.	Fin. cast.	Fin. cast.	Fin. cast.
Ignition, Make.....	Schebler	Schebler	Schebler	Schebler	Schebler	Schebler	Schebler	Schebler	Schebler	Schebler	Schebler
Type, Control.....	Single, hand	Single, hand	Single, hand	Single, hand	Single, fixed	Single, auto.	Single, hand	Single, hand	Single, hand	Single, hand	Single, hand
Governor Drive.....	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor
Speed, M. P. H.....	17	Eight	Eight	Eight	11	9.25	Nine	10	.....	10	10
Clutch Type.....	Dry plate	Dry disc	Dry disc	Dry disc	It. cone	Cone	Cone	Wet disc	Cone	Wet disc	Dry plate
Trans. Gearset.....	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective
Located, Speeds.....	Unit J, three	Unit J, four	Unit J, four	Unit J, four	Unit J, four	Unit J, four	Unit J, four	Unit J, three	Unit J, four	Unit J, four	Unit J, three
Driven by.....	Double chain	Double chain	Double chain	Double chain	Int. gear	Double chain	Double chain	Double chain	Double chain	Double chain	Double chain
Ratio Gear Red.....	10.50-1	13.31-1	13.31-1	13.31-1	9.36-1	12.4-1	12.70-1	8.93-1	10.50-1	.....	12.20-1
Tor. Taken by.....	Radius rod	Radius rod	Radius rod	Radius rod	Torsion arm	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod
Propelled by.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod
Springs, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Rear.....	156, 168, 180	128	128	128	169	150	168	126	151	140	168
Wheelbase.....	168	168	168	168	169	150	168	126	151	140	168
Tire Type.....	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid
Tire Sizes.....	36x6, 40x6d	36x6, 40x7d	36x6, 40x7d	36x6, 40x7d	34x5, 40x6	36x6, 40x7d	36x6, 40x6d	36x6, 40x7d	38x7, 42x7d	36x6, 40x6 d	36x6, 42x6d
Driver's Seat.....	Left	Right	Right	Right	Right	Left	Left	Right	Right	Right	Left
Control Levers.....	Centre	Centre	Centre	Centre	Centre	Centre	Centre	Centre	Centre	Centre	Centre

## LOAD CAPACITY, 12,000 POUNDS.

Make.....	Tiffin	Walter	Saurer	Commercial	Transport Tr.	Domination	Standard Trac.	Sterling	Dayton	Walter	Standard Trac.
Model.....	S C	.....	.....	Tractor	T	Tractor	B	.....	E	A C	D
Capacity.....	12,000	12,000	13,000	10,000	10,000	12,000	12,000	14,000	15,000	15,000	20,000
Chassis Price.....	\$4300	\$5000	\$5800	\$2500	\$2500	\$3200	\$3450	\$4750	\$4500	\$4250	\$4250
S. A. E. Rating.....	33.75	30.65	30.65	19.61	19.61	36.15	36.15	36.15	40.00	30.65	36.15
Engine Cyls.....	Six	Four	Four	Four	Four	Four	Four	Four	Four	Four	Four
How Cast.....	Three	Block	Block	Block	Block	Block	Block	Block	Block	Block	Block
Bore, Stroke.....	3 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	5 1/2 x 7	4 1/2 x 6	4 1/2 x 6 1/2
Valve Location.....	Right	Right	Right	Right	Right	Opposite	Left	Right	Opposite	Right	Left
No. Main Bearings.....	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three
Max. R. P. M.....	1000	1000	1000	1350	1300	1000	1000	950	1000	.....	1000
Lubrication.....	Spl. pres.	Centrifugal	Centrifugal	Pressure	Centrifugal	Pressure	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal
Radiator Type.....	Fin. sheet	Fin. sheet	Fin. sheet	Thermo	Thermo	Fin. cast.	Fin. cast.	Fin. cast.	Fin. cast.	Fin. cast.	Sq.-t. sheet
Carburetor.....	Schebler	Schebler	Schebler	Zenith	Zenith	Schebler	Holley	Holley	Optional	Zenith	Holley
Ignition, Make.....	Schebler	Schebler	Schebler	Bosch	Bosch	Schebler	Bosch	Eisemann	Bosch	Eisemann	Bosch
Type, Control.....	Single, hand	Single, hand	Single, hand	Single, fixed	Single, fixed	Single, hand	Dual, hand	Dual, auto.	Dual, hand	Single, auto.	Dual, hand
Governor Drive.....	Motor	Motor	Motor	D. shaft	D. shaft	Motor	Motor	Motor	Motor	Motor	.....
Speed, M. P. H.....	10	9 1/2	9 1/2	10	10	Nine	12	10	10	10	Eight
Clutch Type.....	Dry plate	Cone	Cone	Dry disc	Dry disc	Dry disc	Wet disc	Dry disc	Wet disc	Cone	Wet disc
Trans. Gearset.....	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Ind. C.
Located, Speeds.....	Unit M, four	Unit J, four	Unit M, four	Unit M, two	Unit M, three	Unit M, three	Unit M, three	Unit M, four	Unit J, four	Unit M, four	Amid., three
Driven by.....	Double chain	Double chain	Double chain	20.14-1	Top worm	Top worm	Double chain	Double chain	Double chain	Spur-g., four	Double chain
Ratio Gear Red.....	12.20-1	30.50-1	30.50-1	20.14-1	13.60-1	13.00-1	9.00-1	11.67-1	14.10-1	.....	18.00-1
Tor. Taken by.....	Springs	Springs	Springs	Springs	Springs	Springs	Springs	Springs	Springs	Springs	.....
Propelled by.....	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod
Springs, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Rear.....	156 1/2	156 1/2	156 1/2	80	80	90	72	168	148	144	78
Wheelbase.....	168	168	168	.....	.....	.....	.....	.....	.....	.....	.....
Tire Type.....	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid
Tire Sizes.....	36x6, 42x6d	36x6, 40x6d	36x6, 42x6d	36x4d, 36x4d	34x4, 34x3 1/2	36x3, 36x4d	36x5, 36x5d	36x6, 40x7d	36x7, 41x7d	40x6, 40x6d	36x5, 40x6d
Driver's Seat.....	Left	Right	Right	Left	Left	Left	Right	Left	Left	Left	Right
Control Levers.....	Centre	Centre	Centre	Centre	Centre	C. & L.	Centre	Centre	Centre	Centre	Centre

## TRACTORS, LOAD CAPACITY 10,000 TO 20,000 POUNDS.

Make.....	Tiffin	Walter	Saurer	Commercial	Transport Tr.	Domination	Standard Trac.	Sterling	Dayton	Walter	Standard Trac.
Model.....	S C	.....	.....	Tractor	T	Tractor	B	.....	E	A C	D
Capacity.....	12,000	12,000	13,000	10,000	10,000	12,000	12,000	14,000	15,000	15,000	20,000
Chassis Price.....	\$4300	\$5000	\$5800	\$2500	\$2500	\$3200	\$3450	\$4750	\$4500	\$4250	\$4250
S. A. E. Rating.....	33.75	30.65	30.65	19.61	19.61	36.15	36.15	36.15	40.00	30.65	36.15
Engine Cyls.....	Six	Four	Four	Four	Four	Four	Four	Four	Four	Four	Four
How Cast.....	Three	Block	Block	Block	Block	Block	Block	Block	Block	Block	Block
Bore, Stroke.....	3 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	4 1/2 x 5 1/2	5 1/2 x 7	4 1/2 x 6	4 1/2 x 6 1/2
Valve Location.....	Right	Right	Right	Right	Right	Opposite	Left	Right	Opposite	Right	Left
No. Main Bearings.....	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three
Max. R. P. M.....	1000	1000	1000	1350	1300	1000	1000	950	1000	.....	1000
Lubrication.....	Spl. pres.	Centrifugal	Centrifugal	Pressure	Centrifugal	Pressure	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal
Radiator Type.....	Fin. sheet	Fin. sheet	Fin. sheet	Thermo	Thermo	Fin. cast.	Fin. cast.	Fin. cast.	Fin. cast.	Fin. cast.	Sq.-t. sheet
Carburetor.....	Schebler	Schebler	Schebler	Zenith	Zenith	Schebler	Holley	Holley	Optional	Zenith	Holley
Ignition, Make.....	Schebler	Schebler	Schebler	Bosch	Bosch	Schebler	Bosch	Eisemann	Bosch	Eisemann	Bosch
Type, Control.....	Single, hand	Single, hand	Single, hand	Single, fixed	Single, fixed	Single, hand	Dual, hand	Dual, auto.	Dual, hand	Single, auto.	Dual, hand
Governor Drive.....	Motor	Motor	Motor	D. shaft	D. shaft	Motor	Motor	Motor	Motor	Motor	.....
Speed, M. P. H.....	10	9 1/2	9 1/2	10	10	Nine	12	10	10	10	Eight
Clutch Type.....	Dry plate	Cone	Cone	Dry disc	Dry disc	Dry disc	Wet disc	Dry disc	Wet disc	Cone	Wet disc
Trans. Gearset.....	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Selective	Ind. C.
Located, Speeds.....	Unit M, four	Unit J, four	Unit M, four	Unit M, two	Unit M, three	Unit M, three	Unit M, three	Unit M, four	Unit J, four	Unit M, four	Amid., three
Driven by.....	Double chain	Double chain	Double chain	20.14-1	Top worm	Top worm	Double chain	Double chain	Double chain	Spur-g., four	Double chain
Ratio Gear Red.....	12.20-1	30.50-1	30.50-1	20.14-1	13.60-1	13.00-1	9.00-1	11.67-1	14.10-1	.....	18.00-1
Tor. Taken by.....	Springs	Springs	Springs	Springs	Springs	Springs	Springs	Springs	Springs	Springs	.....
Propelled by.....	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod	Radius rod
Springs, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Rear.....	156 1/2	156 1/2	156 1/2	80	80	90	72	168	148	144	78
Wheelbase.....	168	168	168	.....	.....	.....	.....	.....	.....	.....	.....
Tire Type.....	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid
Tire Sizes.....	36x6, 42x6d	36x6, 40x6d	36x6, 42x6d	36x4d, 36x4d	34x4, 34x3 1/2	36x3, 36x4d	36x5, 36x5d	36x6, 40x7d	36x7, 41x7d	40x6, 40x6d	36x5, 40x6d
Driver's Seat.....	Left	Right	Right	Left	Left	Left	Right	Left	Left	Left	Right
Control Levers.....	Centre	Centre	Centre	Centre	Centre	C. & L.	Centre	Centre	Centre	Centre	Centre

# TRACTORS, LOAD CAPACITY TO 30,000 POUNDS.

Make.	Bully	Tractor	Knox	Tractor	Mercury	Bulley	Boenlx	Walter	Mack	Tractor	Stewart	Sanford	Brookway	Brookway	Kelly
Model.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Capacity.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Chassis Price.	\$3400		\$4500		\$3400		.....	24,000	30,000	Spl. pres.	1000	1500	1500 to 2000	2500	3000
S. A. E. Rating	32.40		40.00		\$5000		48.2	\$4000	\$4000	Centrifugal	\$895	\$1290	\$1450	\$1600	\$1825
Engine Cyls.	Four		Four		30.65		Four	40.00	40.00	Fin. cast	Four	Four	Four	Four	Four
How Cast.	.....		.....		Block		Single	.....	.....	Schebler	Block	Block	Block	Block	Block
How Stroke.	.....		.....		4 1/2 x 5		5 1/2 x 7	.....	.....	Optional	3 1/2 x 5	3 1/2 x 5	3 1/2 x 5	3 1/2 x 5	3 1/2 x 5
Valve Location	Opposite		Head		.....		.....	Right	Right	Bosch	Right	Right	Left	Left	Left
No. Main Bear.	Five		Three		Five		Five	Three	Three	.....	Two	Three	Three	Three	Three
Max. R. P. M.	.....		2000		.....		.....	.....	1000	.....	2000	1500	1350	1300	1200
Lubrication.	.....		Pressure		.....		.....	.....	Spl. pres.	.....	.....	.....	.....	.....	.....
Cool. System.	.....		Centrifugal		.....		.....	.....	Centrifugal	.....	.....	.....	.....	.....	.....
Radiator Type.	Cell. sheet		Cell. sheet		.....		.....	.....	Fin. cast	.....	.....	.....	.....	.....	.....
Carburetor.	.....		.....		.....		.....	.....	Optional	.....	.....	.....	.....	.....	.....
Ignition.	.....		.....		.....		.....	.....	Bosch	.....	.....	.....	.....	.....	.....
Type, Control.	.....		.....		.....		.....	.....	.....	.....	.....	.....	.....	.....	.....
Governor Drive	.....		.....		.....		.....	.....	.....	.....	.....	.....	.....	.....	.....
Speed, M. P. H.	.....		.....		.....		.....	.....	.....	.....	.....	.....	.....	.....	.....
Clutch Type.	.....		.....		.....		.....	.....	.....	.....	.....	.....	.....	.....	.....
Trans. Gearset	.....		.....		.....		.....	.....	.....	.....	.....	.....	.....	.....	.....
Located, Speeds	.....		.....		.....		.....	.....	.....	.....	.....	.....	.....	.....	.....
Driven by.	.....		.....		.....		.....	.....	.....	.....	.....	.....	.....	.....	.....
Ratio Gear Red.	.....		.....		.....		.....	.....	.....	.....	.....	.....	.....	.....	.....
Tor. Taken by.	.....		.....		.....		.....	.....	.....	.....	.....	.....	.....	.....	.....
Propelled by.	.....		.....		.....		.....	.....	.....	.....	.....	.....	.....	.....	.....
Spring, For.	.....		.....		.....		.....	.....	.....	.....	.....	.....	.....	.....	.....
Spring, Rear.	.....		.....		.....		.....	.....	.....	.....	.....	.....	.....	.....	.....
Wheelbase	.....		.....		.....		.....	.....	.....	.....	.....	.....	.....	.....	.....
Tire Type	.....		.....		.....		.....	.....	.....	.....	.....	.....	.....	.....	.....
Tire Size	.....		.....		.....		.....	.....	.....	.....	.....	.....	.....	.....	.....
Driver's Seat.	.....		.....		.....		.....	.....	.....	.....	.....	.....	.....	.....	.....
Control Levers	.....		.....		.....		.....	.....	.....	.....	.....	.....	.....	.....	.....

# LOAD CAPACITY, 1000 TO 1500 POUNDS.

Make.	New York	Palmer	Kelly	Spring.	Krebs
Model.	.....	.....	.....	.....	.....
Capacity.	.....	.....	.....	.....	.....
Chassis Price.	\$1800		3000		7000
S. A. E. Rating	27.20		22.5		32.40
Engine Cyls.	Four		Four		Four
How Cast.	.....		.....		.....
How Stroke.	.....		.....		.....
Valve Location	.....		.....		.....
No. Main Bear.	Three		Three		Three
Max. R. P. M.	.....		.....		.....
Lubrication.	.....		.....		.....
Cool. System.	.....		.....		.....
Radiator Type.	.....		.....		.....
Carburetor.	.....		.....		.....
Ignition.	.....		.....		.....
Type, Control	.....		.....		.....
Governor Drive	.....		.....		.....
Speed, M. P. H.	.....		.....		.....
Clutch Type.	.....		.....		.....
Trans. Gearset	.....		.....		.....
Located, Speeds	.....		.....		.....
Driven by.	.....		.....		.....
Ratio Gear Red.	.....		.....		.....
Tor. Taken by	.....		.....		.....
Propelled by.	.....		.....		.....
Spring, For.	.....		.....		.....
Spring, Rear.	.....		.....		.....
Wheelbase	.....		.....		.....
Tire Type	.....		.....		.....
Tire Size	.....		.....		.....
Driver's Seat.	.....		.....		.....
Control Levers	.....		.....		.....

Abbreviations; Price, \*, vehicle complete. Valve location, opp. T. head; right or left, L. head; R. or L. and H. slide and head; top, horizontal opposed engine; two-cy., two-cycle. Lubrication, spl. pres., splash and pressure; cir. spl., circulating splash; fuel, injected with fuel; P. & S., pump and splash. Cooling, thermo, thermo-siphon; cent., centrifugal pump; gear, gear pump. Radiator type, sq.-t. sheet, square or flat tube, sheet metal case; fin. sheet, fin. tube core, sheet metal case; Z-Z-t case, cast aluminum case; cell. sheet, cellular core, sheet metal case; ring cast, copper tube in ring, aluminum tank; sq.-t. cast, square tube core, cast aluminum case; cell. cast, cellular core, cast aluminum case; Z-Z-t sheet, zig-zag tube core, sheet metal case. Ignition, At.-Kt., Atwater Kent; auto, automatic advance; hand advance, hand advance; 2-pt., two-point, fixed, battery circuit retarded, magneto circuit advanced. Governor Drive, D. shaft, driving shaft; clutch Type, exp. shoe, expanding shoe; cone, reversed cone. Transmission Gearset, ind. C., constant mesh individual clutch; inf. infinite speeds; amid, amidships; unit M, unit with engine; unit J, unit with jackshaft; unit X, unit with axle. Driven by, int.-g.-f., internal gear, front wheels; double red., double reduction; int.-g. 4, internal gear, four wheels. Torque Taken by, sub F, sub-frame. Propelled by, springs, rear springs; sub F, sub-frame.

# Gasoline Truck and Tractor Specifications

The foregoing tabulation includes specifications of 474 different types of gasoline motor wagons and trucks that are produced by 170 different manufacturers. The detail has been carefully checked and revised to date and it will be noted that a number of the concerns have within a comparatively short time radically changed their production, building either new types or machines of different capacities, so that the model designations differ from those that had been standard.

The space required for the specifications has necessitated a continuance of the tables into the May edition of MOTOR TRUCK, which will, in addition, include a full series of specifications and capacities of farm tractors and car and truck trailers and semi-trailers. With these supplementary data the specifications will be complete, and will be the most comprehensive of the industry ever prepared or published.



# MECHANICAL SPECIFICATIONS OF AMERICAN 1916 ELECTRIC WAGONS, TRUCKS AND TRACTORS.

For Manufacturers' Names, Addresses and Other Detail, See General Indices.

## LOAD CAPACITY 750 POUNDS.

Make.....	Commerical	Ward	Walker	Waverley
Model.....	W S	W S	W S	W S
Capacity.....	750	750	750	750
Price, with Bat.....	\$1850	\$1850	\$1850	\$1850
Price, No Bat.....	\$1175	\$1175	\$1175	\$1175
No. Motors.....	One	One	One	One
Location.....	Aml.	Aml.	Aml.	Aml.
Make of Motor.....	G. E.	G. E.	G. E.	G. E.
Type Winding.....	Series	Series	Series	Series
Voltage-H. P.....	80	80	80	80
Speed, Light.....	14	14	14	14
Speed, Loaded.....	10	10	10	10
Con. Located.....	U. hood	U. hood	U. hood	U. hood
Con. Speed.....	4, r 2	4, r 2	4, r 2	4, r 2
Reduction Gear.....	Sp. bev.	Sp. bev.	Sp. bev.	Sp. bev.
Final Drive.....	Herring	Herring	Herring	Herring
Total Gear Red.....	12.00-1	12.00-1	12.00-1	12.00-1
Tor. Taken by.....	Torsion arm	Torsion arm	Torsion arm	Torsion arm
Propulsion by.....	Spring	Spring	Spring	Spring
Spring, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Spring, Rear.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.....	90	90	90	90
Type Tires.....	Solid	Solid	Solid	Solid
Tire Size.....	32x2 1/2, 32x2 1/2	32x2 1/2, 32x2 1/2	32x2 1/2, 32x2 1/2	32x2 1/2, 32x2 1/2
Driver's Seat.....	Left	Left	Left	Left
Con. Lever.....	U. wheel	U. wheel	U. wheel	U. wheel
Bat. Location.....	U. seat	U. seat	U. seat	U. seat
Bat. Make, Type.....	Edison, A4	Edison, A4	Edison, A4	Edison, A4
No. Cells, Trays.....	60, 10	60, 10	60, 10	60, 10
Amp. Hrn. Cap.....	204	204	204	204
Mileage, Light.....	75	75	75	75
Mileage, Loaded.....	60	60	60	60

## LOAD CAPACITY 1000 POUNDS.

Make.....	Commercial	G. M. C.	G. V.	Waverley
Model.....	1	1	1	1
Capacity.....	1000	1000	1000	1000
Price, with Bat.....	\$2010	\$2010	\$2010	\$2010
Price, No Bat.....	\$1500	\$1500	\$1500	\$1500
No. Motors.....	One	One	One	One
Location.....	Rear	Rear	Rear	Rear
Make of Motor.....	G. E.	G. E.	G. E.	G. E.
Type Winding.....	Series	Series	Series	Series
Voltage-H. P.....	80, 2	80, 2	80, 2	80, 2
Speed, Light.....	14	14	14	14
Speed, Loaded.....	12	12	12	12
Con. Located.....	U. seat	U. seat	U. seat	U. seat
Con. Speed.....	5, r 2	5, r 2	5, r 2	5, r 2
Reduction Gear.....	Double chain	Double chain	Double chain	Double chain
Final Drive.....	Bevel	Bevel	Bevel	Bevel
Total Gear Red.....	8.40-1	8.40-1	8.40-1	8.40-1
Tor. Taken by.....	Spring	Spring	Spring	Spring
Propulsion by.....	Radius rod	Radius rod	Radius rod	Radius rod
Spring, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Spring, Rear.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.....	90	90	90	90
Type Tires.....	Solid	Solid	Solid	Solid
Tire Size.....	32x3 1/2, 32x3 1/2	32x3 1/2, 32x3 1/2	32x3 1/2, 32x3 1/2	32x3 1/2, 32x3 1/2
Driver's Seat.....	Left	Left	Left	Left
Con. Lever.....	U. wheel	U. wheel	U. wheel	U. wheel
Bat. Location.....	U. seat	U. seat	U. seat	U. seat
Bat. Make, Type.....	Edison or Lead	Edison, A4	Edison, A4	Edison, A4
No. Cells, Trays.....	60-6, 42-5	60, 10	60, 10	60, 10
Amp. Hrn. Cap.....	Optional	150	150	150
Mileage, Light.....	50	50	50	50
Mileage, Loaded.....	45	45	45	45

## LOAD CAPACITY 1000 POUNDS.

Make.....	Commercial	G. M. C.	G. V.	Waverley
Model.....	1	1	1	1
Capacity.....	1000	1000	1000	1000
Price, with Bat.....	\$2010	\$2010	\$2010	\$2010
Price, No Bat.....	\$1500	\$1500	\$1500	\$1500
No. Motors.....	One	One	One	One
Location.....	Rear	Rear	Rear	Rear
Make of Motor.....	G. E.	G. E.	G. E.	G. E.
Type Winding.....	Series	Series	Series	Series
Voltage-H. P.....	80, 2	80, 2	80, 2	80, 2
Speed, Light.....	14	14	14	14
Speed, Loaded.....	12	12	12	12
Con. Located.....	U. seat	U. seat	U. seat	U. seat
Con. Speed.....	5, r 2	5, r 2	5, r 2	5, r 2
Reduction Gear.....	Double chain	Double chain	Double chain	Double chain
Final Drive.....	Bevel	Bevel	Bevel	Bevel
Total Gear Red.....	8.40-1	8.40-1	8.40-1	8.40-1
Tor. Taken by.....	Spring	Spring	Spring	Spring
Propulsion by.....	Radius rod	Radius rod	Radius rod	Radius rod
Spring, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Spring, Rear.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.....	90	90	90	90
Type Tires.....	Solid	Solid	Solid	Solid
Tire Size.....	32x3 1/2, 32x3 1/2	32x3 1/2, 32x3 1/2	32x3 1/2, 32x3 1/2	32x3 1/2, 32x3 1/2
Driver's Seat.....	Left	Left	Left	Left
Con. Lever.....	U. wheel	U. wheel	U. wheel	U. wheel
Bat. Location.....	U. seat	U. seat	U. seat	U. seat
Bat. Make, Type.....	Edison or Lead	Edison, A4	Edison, A4	Edison, A4
No. Cells, Trays.....	60-6, 42-5	60, 10	60, 10	60, 10
Amp. Hrn. Cap.....	Optional	150	150	150
Mileage, Light.....	50	50	50	50
Mileage, Loaded.....	45	45	45	45

## LOAD CAPACITY 1000 POUNDS.

Make.....	Commercial	G. M. C.	G. V.	Waverley
Model.....	1	1	1	1
Capacity.....	1000	1000	1000	1000
Price, with Bat.....	\$2010	\$2010	\$2010	\$2010
Price, No Bat.....	\$1500	\$1500	\$1500	\$1500
No. Motors.....	One	One	One	One
Location.....	Rear	Rear	Rear	Rear
Make of Motor.....	G. E.	G. E.	G. E.	G. E.
Type Winding.....	Series	Series	Series	Series
Voltage-H. P.....	80, 2	80, 2	80, 2	80, 2
Speed, Light.....	14	14	14	14
Speed, Loaded.....	12	12	12	12
Con. Located.....	U. seat	U. seat	U. seat	U. seat
Con. Speed.....	5, r 2	5, r 2	5, r 2	5, r 2
Reduction Gear.....	Double chain	Double chain	Double chain	Double chain
Final Drive.....	Bevel	Bevel	Bevel	Bevel
Total Gear Red.....	8.40-1	8.40-1	8.40-1	8.40-1
Tor. Taken by.....	Spring	Spring	Spring	Spring
Propulsion by.....	Radius rod	Radius rod	Radius rod	Radius rod
Spring, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Spring, Rear.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.....	90	90	90	90
Type Tires.....	Solid	Solid	Solid	Solid
Tire Size.....	32x3 1/2, 32x3 1/2	32x3 1/2, 32x3 1/2	32x3 1/2, 32x3 1/2	32x3 1/2, 32x3 1/2
Driver's Seat.....	Left	Left	Left	Left
Con. Lever.....	U. wheel	U. wheel	U. wheel	U. wheel
Bat. Location.....	U. seat	U. seat	U. seat	U. seat
Bat. Make, Type.....	Edison or Lead	Edison, A4	Edison, A4	Edison, A4
No. Cells, Trays.....	60-6, 42-5	60, 10	60, 10	60, 10
Amp. Hrn. Cap.....	Optional	150	150	150
Mileage, Light.....	50	50	50	50
Mileage, Loaded.....	45	45	45	45

## LOAD CAPACITY 2000 POUNDS.

Make.....	Commercial	G. M. C.	G. V.	Waverley
Model.....	2	2	2	2
Capacity.....	2000	2000	2000	2000
Price, with Bat.....	\$2300	\$2300	\$2300	\$2300
Price, No Bat.....	\$1800	\$1800	\$1800	\$1800
No. Motors.....	Two	Two	Two	Two
Location.....	Unit X	Unit X	Unit X	Unit X
Make of Motor.....	G. E.	G. E.	G. E.	G. E.
Type Winding.....	Series	Series	Series	Series
Voltage-H. P.....	80, 3 1/2	80, 3 1/2	80, 3 1/2	80, 3 1/2
Speed, Light.....	14	14	14	14
Speed, Loaded.....	12	12	12	12
Con. Located.....	U. seat	U. seat	U. seat	U. seat
Con. Speed.....	5, r 2	5, r 2	5, r 2	5, r 2
Reduction Gear.....	Double chain	Double chain	Double chain	Double chain
Final Drive.....	Bevel	Bevel	Bevel	Bevel
Total Gear Red.....	11.50-1	11.50-1	11.50-1	11.50-1
Tor. Taken by.....	Spring	Spring	Spring	Spring
Propulsion by.....	Radius rod	Radius rod	Radius rod	Radius rod
Spring, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Spring, Rear.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.....	100	100	100	100
Type Tires.....	Solid	Solid	Solid	Solid
Tire Size.....	32x3 1/2, 32x3 1/2	32x3 1/2, 32x3 1/2	32x3 1/2, 32x3 1/2	32x3 1/2, 32x3 1/2
Driver's Seat.....	Left	Left	Left	Left
Con. Lever.....	U. wheel	U. wheel	U. wheel	U. wheel
Bat. Location.....	U. seat	U. seat	U. seat	U. seat
Bat. Make, Type.....	Edison or Lead	Edison, A6	Edison, A6	Edison, A6
No. Cells, Trays.....	60-6, 42-5	60, 10	60, 10	60, 10
Amp. Hrn. Cap.....	Optional	187.5	187.5	187.5
Mileage, Light.....	60	60	60	60
Mileage, Loaded.....	42	42	42	42

## LOAD CAPACITY 3000 AND 4000 POUNDS.

Make.....	Commercial	G. M. C.	G. V.	Waverley
Model.....	3	3	3	3
Capacity.....	3000	3000	3000	3000
Price, with Bat.....	\$2650	\$2650	\$2650	\$2650
Price, No Bat.....	\$1450	\$1450	\$1450	\$1450
No. Motors.....	One	One	One	One
Location.....	Rear	Rear	Rear	Rear
Make of Motor.....	G. E.	G. E.	G. E.	G. E.
Type Winding.....	Series	Series	Series	Series
Voltage-H. P.....	80, 3	80, 3	80, 3	80, 3
Speed, Light.....	10	10	10	10
Speed, Loaded.....	10	10	10	10
Con. Located.....	U. seat	U. seat	U. seat	U. seat
Con. Speed.....	5, r 3	5, r 3	5, r 3	5, r 3
Reduction Gear.....	Double chain	Double chain	Double chain	Double chain
Final Drive.....	Bevel	Bevel	Bevel	Bevel
Total Gear Red.....	14.00-1	14.00-1	14.00-1	14.00-1
Tor. Taken by.....	Spring	Spring	Spring	Spring
Propulsion by.....	Radius rod	Radius rod	Radius rod	Radius rod
Spring, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Spring, Rear.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.....	120	120	120	120
Type Tires.....	Solid	Solid	Solid	Solid
Tire Size.....	32x5, 32x5	32x5, 32x5	32x5, 32x5	32x5, 32x5
Driver's Seat.....	Left	Left	Left	Left
Con. Lever.....	U. wheel	U. wheel	U. wheel	U. wheel
Bat. Location.....	U. seat	U. seat	U. seat	U. seat
Bat. Make, Type.....	Edison or Lead	Edison, A6	Edison, A6	Edison, A6
No. Cells, Trays.....	60-8, 42-6	60, 10	60, 10	60, 10
Amp. Hrn. Cap.....	Optional	225	225	225
Mileage, Light.....	60	60	60	60
Mileage, Loaded.....	40	40	40	40

## LOAD CAPACITY 3000 AND 4000 POUNDS.

Make.....	Commercial	G. M. C.	G. V.	Waverley
Model.....	4	4	4	4
Capacity.....	4000	4000	4000	4000
Price, with Bat.....	\$2800	\$2800	\$2800	\$2800
Price, No Bat.....	\$1875	\$1875	\$1875	\$1875
No. Motors.....	One	One	One	One
Location.....	Rear	Rear	Rear	Rear
Make of Motor.....	G. E.	G. E.	G. E.	G. E.
Type Winding.....	Series	Series	Series	Series
Voltage-H. P.....	80, 3	80, 3	80, 3	80, 3
Speed, Light.....	10	10	10	10
Speed, Loaded.....	10	10	10	10
Con. Located.....	U. seat	U. seat	U. seat	U. seat
Con. Speed.....	5, r 3	5, r 3	5, r 3	5, r 3
Reduction Gear.....	Double chain	Double chain	Double chain	Double chain
Final Drive.....	Bevel	Bevel	Bevel	Bevel
Total Gear Red.....	14.00-1	14.00-1	14.00-1	14.00-1
Tor. Taken by.....	Spring	Spring	Spring	Spring
Propulsion by.....	Radius rod	Radius rod	Radius rod	Radius rod
Spring, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Spring, Rear.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.....	120	120	120	120
Type Tires.....	Solid	Solid	Solid	Solid
Tire Size.....	32x5, 32x5	32x5, 32x5	32x5, 32x5	32x5, 32x5
Driver's Seat.....	Left	Left	Left	Left
Con. Lever.....	U. wheel	U. wheel	U. wheel	U. wheel
Bat. Location.....	U. seat	U. seat	U. seat	U. seat
Bat. Make, Type.....	Edison or Lead	Edison, A6	Edison, A6	Edison, A6
No. Cells, Trays.....	60-8, 42-6	60, 10	60, 10	60, 10
Amp. Hrn. Cap.....	Optional	225	225	225
Mileage, Light.....	60	60	60	60
Mileage, Loaded.....	40	40	40	40

## LOAD CAPACITY 4000 POUNDS.

Make.....	G. M. C.	G. V.	Walker	Ward	Waverley
Model.....	4	1916	L	E B	.....
Capacity.....	4000	7000	4000	4000	4000
Price, with Bat.....	\$2850	\$2650	\$3000	.....	\$3000
Price, No Bat.....	\$1650	.....	.....	.....	.....
No. Motors.....	One	One	One	One	One
Location.....	Rear	Rear	Unit X	Amlid.	Rear
Make of Motor.....	G. E.	G. E.	West.	.....	G. E.
Type Winding.....	Series	Series	Series	Series	Series
Voltage-H. P.....	60-4	85, 2 1/2	60-40, 80-35	80	85
Speed, Light.....	Eight	11	13	.....	.....
Speed, Loaded.....	Eight	Nine	12	Seven	Nine
Con. Located.....	U. hood	U. seat	U. seat	U. seat	U. seat
Con. Speeds.....	5, r 1	5, r 2	5, r 5	4, r 2	4, r 2
Reduction Gear.....	Bevel	Single chain	Bevel	Double chain	Bevel
Final Drive.....	Double chain	Double chain	Double chain	Double chain	Double chain
Total Gear Red.....	12.0-1	11.61-1	17.00-1	.....	.....
Tor. Taken by.....	Springs	Radius rod	Springs	Radius rod	Radius rod
Propulsion by.....	Radius rod	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Rear.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.....	138	112 1/2	107, optional	111	114
Type Tires.....	Solid	Solid	107, optional	Solid	Solid
Tire Sizes.....	32x4, 36x3 1/2 d	36x4, 36x3 d	38x4, 38x6	36x4, 38x6	37x5, 37x4 d
Driver's Seat.....	Left	Left	Left	Left	Left
Con. Lever.....	T. wheel	Left seat	U. wheel	Left	Left
Bat. Location.....	U. seat	Amlid-u.	Amlid-u.	Amlid-u.	Amlid-u.
Bat. Make, Type.....	Edison, A6	21 G V X	Edison, A8	.....	.....
No. Cells, Trays.....	60	44, 6	60, 10	42	42
Amp. Hrs. Cap.....	225	225	Optional	204	.....
Mileage, Light.....	40	40 to 60	40 to 60	35	35
Mile, Loaded.....	32	45	40 to 60	35	35

## LOAD CAPACITY 7000 AND 8000 POUNDS.

Make.....	Lanaden	Waverley	Walker	Ward
Model.....	M	.....	E	E C
Capacity.....	7000	7000	8000	7000
Price, with Bat.....	\$4455	\$3100	.....	.....
Price, No Bat.....	\$2475	.....	.....	.....
No. Motors.....	One	One	One	One
Location.....	Unit J	Rear	Unit X	Amlid.
Make of Motor.....	G. E.	G. E.	West.	.....
Type Winding.....	Series	Series	Series	Series
Voltage-H. P.....	60	85	60-70, 80-62	80
Speed, Light.....	.....	.....	11	.....
Speed, Loaded.....	Seven	Eight	10	Six
Con. Located.....	U. hood	U. seat	U. seat	U. seat
Con. Speeds.....	4, r 2	4, r 4	5, r 5	4, r 2
Reduction Gear.....	Bevel	Bevel	Bevel	Single chain
Final Drive.....	Double chain	Double chain	Double chain	Double chain
Total Gear Red.....	13.00-1	.....	16.00-1	.....
Tor. Taken by.....	Springs	Radius rod	Springs	Radius rod
Propulsion by.....	Radius rod	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Rear.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.....	130	127	130, optional	132
Type Tires.....	Solid	Solid	Solid	Solid
Tire Sizes.....	36x5, 36x4 d	37x6, 37x5	38x5, 38x5	38x6, 40x3 1/2 d
Driver's Seat.....	Left	Left	Left	Left
Con. Lever.....	U. wheel	Left	Left	Left
Bat. Location.....	Amlid-u.	Amlid-u.	Amlid-u.	Amlid-u.
Bat. Make, Type.....	Edison, A10	Exide	Edison or Lead	.....
No. Cells, Trays.....	60, 10	42	60, 44	42
Amp. Hrs. Cap.....	280	.....	Optional	280
Mileage, Light.....	40	40 to 50	40 to 50	40
Mile, Loaded.....	50	35	40 to 50	30

Abbreviations: Motor Location, Amlid, amidships; Unit J, unit with jackshaft; Unit X, unit with axle. Controller Location, U. seat, under seat; U. floor, under cub floor. U. hood, under hood; btw. seats, between seats. Reduction Gear, S chain, silent chain. Final Drive, dbl. chn., double chain; sp. bev., spiral bevel gears; herring, herringbone gears; F, front wheels; 4, four wheels. Torque Taken by, Tor. arm, torque arm; cor. t., torsion tube; sub F., sub frame. Propulsion by, rad. rod., radius rod; sub F., sub frame. Springs, elliptic, full elliptic; 1/2 ell., semi-elliptic; 3/4 ell., three-quarters elliptic. Tire Types, cush. cushion, S. and St., solid rubber front, steel rear. Tire Sizes, D. dual, Controller Lever, U. wheel, under steering wheel; T. wheel, on top of steering wheel; L. seat, at left of seat; btw. seats, between seats; cent., at centre. Battery Location, amid U. amidships, under seat; ends O, at both ends, over frame. Battery Make and Type, rear U. and H. at rear under frame and under a hood forward; front U. at front under frame. U. seat, under seat; U. hood, under hood.

## LOAD CAPACITY 6000 AND 7000 POUNDS.

Make.....	Walker	Ward	Waverley	Commercial	Couple Gear	G. M. C.	G. V.
Model.....	D	E B	.....	H	7	7	1916
Capacity.....	6000	4000	4000	7000	7000	7000	7000
Price, with Bat.....	.....	.....	.....	\$3500	\$1200	\$2560	\$3310
Price, No Bat.....	.....	.....	.....	.....	\$3600	\$2000	.....
No. Motors.....	One	One	One	One	One	One	One
Location.....	Unit X	Rear	Rear	Unit X	In wheel	Rear	Rear
Make of Motor.....	West.	G. E.	G. E.	G. E.	G. E.	G. E.	G. E.
Type Winding.....	Series	Series	Series	Series	Series	Series	Series
Voltage-H. P.....	60-70, 80-62	85	85	60, 85	88, 12	60, 5 1/4	85, 4
Speed, Light.....	12	Nine	Nine	11	10	Seven	Eight
Speed, Loaded.....	11	U. seat	U. seat	Eight	Eight	U. hood	U. seat
Con. Located.....	U. seat	4, r 2	4, r 2	U. seat	btw. seats	U. hood	5, r 2
Con. Speeds.....	5, r 5	.....	.....	5, r 5	5, r 5	.....	.....
Reduction Gear.....	Bevel	Double chain	Double chain	Double chain	Bevel	Double chain	Double chain
Final Drive.....	Double chain	Double chain	Double chain	Double chain	Bevel	Double chain	Double chain
Total Gear Red.....	16.00-1	.....	.....	17.32-1	25.00-1	12.70-1	13.55-1
Tor. Taken by.....	Springs	Radius rod	Radius rod	Springs	Torsion arm	Springs	Radius rod
Propulsion by.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Rear.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.....	126, optional	114	114	137	96	150	132 1/2
Type Tires.....	Solid	Solid	Solid	Solid	Solid	Solid	Solid
Tire Sizes.....	38x4, 38x4	37x5, 37x4 d	37x5, 37x4 d	36x3 1/2 d, 36x4 d	36x4 d, 36x4 d	32x5, 36x4 d	36x6, 36x6 d
Driver's Seat.....	Left	Left	Left	Left	Left	Left	Left
Con. Lever.....	U. wheel	Left	Left	U. wheel	btw. seats	T. wheel	Left seat
Bat. Location.....	Amlid-u.	Amlid-u.	Amlid-u.	Amlid-u.	Amlid-u.	U. seat	Amlid-u.
Bat. Make, Type.....	Edison or Lead	Exide	Exide	Edison or Lead	Edison or Lead	W.R.T. Edison, A8	27 GVX
No. Cells, Trays.....	60, 44	42	42	60, 44	44, 6	60	44, 6
Amp. Hrs. Cap.....	Optional	204	204	Optional	275	300	331
Mileage, Light.....	40 to 50	35	35	40 to 50	40	41	.....
Mile, Loaded.....	40 to 50	35	35	40 to 50	30	32	40

## LOAD CAPACITY 10,000 POUNDS.

Make.....	G. M. C.	G. V.	Walker	Ward
Model.....	10	1916	N	E D
Capacity.....	10,000	10,000	10,000	10,000
Price, with Bat.....	\$4330	\$3730	\$5190	.....
Price, No Bat.....	\$2350	.....	\$2850	.....
No. Motors.....	One	One	One	One
Location.....	Rear	Rear	Unit J	Amlid.
Make of Motor.....	G. E.	G. E.	G. E.	.....
Type Winding.....	Series	Series	Series	Series
Voltage-H. P.....	60, 7	85, 5	60, 70, 80-62	80
Speed, Light.....	.....	Nine	11	.....
Speed, Loaded.....	Seven	Seven	10	Five
Con. Located.....	U. hood	U. seat	U. seat	U. seat
Con. Speeds.....	5, r 1	5, r 2	5, r 5	4, r 2
Reduction Gear.....	Bevel	Single chain	Bevel	Single chain
Final Drive.....	Double chain	Double chain	Double chain	Double chain
Total Gear Red.....	15.70-1	13.35-1	14.50-1	.....
Tor. Taken by.....	Springs	Radius rod	Springs	Radius rod
Propulsion by.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, For.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Rear.....	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase.....	137	141 1/2	142	130
Type Tires.....	Solid	Solid	Solid	Solid
Tire Sizes.....	36x6, 36x5 d	36x7, 36x5 d	36x7, 36x5 d	40x3 1/2 d, 42x5 d
Driver's Seat.....	Left	Left	Left	Left
Con. Lever.....	U. wheel	U. wheel	U. wheel	Left
Bat. Location.....	Amlid-u.	Amlid-u.	Amlid-u.	Amlid-u.
Bat. Make, Type.....	Edison or Lead	Edison or Lead	Edison or Lead	.....
No. Cells, Trays.....	42, 6	31 GVX	60, 10	42
Amp. Hrs. Cap.....	375	382	.....	357
Mileage, Light.....	40	40 to 50	40 to 50	40 to 50
Mile, Loaded.....	35	45	50	25

Abbreviations: Motor Location, Amlid, amidships; Unit J, unit with jackshaft; Unit X, unit with axle. Controller Location, U. seat, under seat; U. floor, under cub floor. U. hood, under hood; btw. seats, between seats. Reduction Gear, S chain, silent chain. Final Drive, dbl. chn., double chain; sp. bev., spiral bevel gears; herring, herringbone gears; F, front wheels; 4, four wheels. Torque Taken by, Tor. arm, torque arm; cor. t., torsion tube; sub F., sub frame. Propulsion by, rad. rod., radius rod; sub F., sub frame. Springs, elliptic, full elliptic; 1/2 ell., semi-elliptic; 3/4 ell., three-quarters elliptic. Tire Types, cush. cushion, S. and St., solid rubber front, steel rear. Tire Sizes, D. dual, Controller Lever, U. wheel, under steering wheel; T. wheel, on top of steering wheel; L. seat, at left of seat; btw. seats, between seats; cent., at centre. Battery Location, amid U. amidships, under seat; ends O, at both ends, over frame. Battery Make and Type, rear U. and H. at rear under frame and under a hood forward; front U. at front under frame. U. seat, under seat; U. hood, under hood.

# MECHANICAL SPECIFICATIONS OF AMERICAN 1916 ELECTRIC WAGONS, TRUCKS AND TRACTORS.

For Manufacturers' Names, Addresses and Other Details, See General Indices.

## LOAD CAPACITY 10,000 TO 20,000 POUNDS.

Make	Waverley	G. M. C.	Laundon	Walker
Model	A. F.	12	Tractor	Tractor D K
Capacity	12,000	12,000	20,000	20,000
Price, with Bat.	\$3900	\$4840	\$3660	.....
Price, No Bat.	\$3250	\$2500	\$3100	.....
No. Motors	Two	One	One	One
Location	In wheel	Rear	Rear	Unit X
Make of Motor	C. G.	G. E.	G. E.	West.
Type Winding	Series	Series	Series	Series
Voltage-H. P.	36, 6	60, 7	60	Eight
Speed, Light	Six	6 1/2	Five	Six
Speed, Loaded	Seven	6 1/2	U. seat	U. seat
Con. Located	U. seat	5, r 1	4, r 2	5, r 5
Con. Speeds	4, r 4	Bevel	Double chain	Spur gear
Reduction Gear	Double chain	Double chain	Double chain	Double chain
Final Drive	Double chain	Double chain	Double chain	Double chain
Total Gear Red.	25.00-1	15.70-1	9.00-1	.....
Tor. Taken by	Torsion arm	Springs	Springs	Springs
Propulsion by	Radius rod	Radius rod	Radius rod	Radius rod
Springs, For	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Springs, Rear	1/2 elliptic	1/2 elliptic	1/2 elliptic	1/2 elliptic
Wheelbase	136	174	58	74
Type Tires	S. & St.	Solid	Solid	Solid
Tire Sizes	36x5d, 60x5	30x4, 30x5	34x4, 38x6	34x4, 38x6
Driver's Seat	Right	Left	Left	Left
Con. Lever	Rear seats	T. wheel	U. wheel	Left
Bat. Location	U. seat	U. seat	U. wheel	Left
Bat. Make, Type	U.S.L. W.B.T.	Edison, A10	Edison, A8	Edison or Lead
No. Cells, Trays	48, 6	60, 10	60, 10	60, 44
Amp. Hrs. Cap.	325	375	.....	Optional
Mileage, Light	40	32	.....	Optional
Mil., Loaded	35	24	60	Optional

Abbreviations: Motor Location, Amid., amidships; Unit J, unit with jackshaft; Unit X, unit with axle. hood: btw. seats, between seats. Reduction Gear, S chain, silent chain. Final Drive, dbl. chn., double chain; sp. bev., spiral bevel gears; herring, herringbone gears; F, front wheels; 4, four wheels. Torque Taken by, Tor. arm, torque arm; for. t., torsion tube; sub F., sub frame. Propulsion by, rad. rod, radius rods; sub F., sub frame. Springs, elliptic, full elliptic; 1/2 ell., semi-elliptic; 3/4 ell., three-quarters elliptic. Tire Types, cush. cushion; S. and St., solid rubber front, steel rear. Tire Sizes, D. dual, Controller Lever, U. wheel, under steering wheel; T. wheel, on top of steering wheel; L. seat, at left of seat; btw. seats, between seats; cent. at centre. Battery Location, amid U. amidships, under seat; amid O. amidships, over frame; rear O. at rear, over frame; rear U. and H. at rear under frame and under a hood forward; U. hood, under hood; front U. at front under frame; U. seat, under seat; Ends O. at both ends, over frame. Battery Make and Type, Exide Ir., Exide Ironclad.

## Electric Truck and Wagon Specifications

These specifications briefly present the 53 different types built by 11 manufacturers. The details have been revised and corrected and are accurate with reference to these machines. Because of varying necessities that obtain, included in which are pending determinations of designs, a considerable number of specifications have been withheld from this tabulation, which will be published in the May issue of MOTOR TRUCK, together with other information of material importance to all who are concerned in electric vehicles designed and adapted for highway haulage.

The names of the concerns now producing commercially electric freight wagons and trucks appear on other pages of this issue. There is also a directory of the different models, capacities and prices, included with which is an index of the machines as they appear in the foregoing specifications, this giving the number of the pages on which they may be found.

## HISTORY OF BOSCH MAGNETO.

In the March issue of the Bosch News, distribution of which was delayed by freight congestion and paper shortage, the history of the Bosch magneto business is told from the time when Dr. Robert Bosch began his experiments with gas engine ignition in 1883 to the present time. Pictures are shown of the premises occupied by the company at the beginning of its American business and of the magnificent factories which it now operates at Springfield, Mass.

## BURD COMPANY'S ORGANIZATION.

A. C. Preston, recently with the Gahrman-Pinchbeck Company of Albany, N. Y., Buick distributor, has been appointed representative for the Burd High Compression Ring Company in the Albany territory. The company has opened sales rooms at 899 Boylston street, Boston, with E. B. Allen in charge. The Milwaukee offices have been removed from 403 Jefferson building to 813 Grand avenue. Robert Allen has resigned as manager of the San Francisco branch and will be succeeded by H. B. Rathbone. A. C. Hansen, in charge of Seattle territory, has moved his offices from 538 Central building to 705 East Pike street.

## LETTER SERVICE FOR DEALERS.

The Goodyear Tire and Rubber Company, which operates the largest multi-graph department in the United States, furnishes to its dealers samples of a large number of series of letters from which they may select a series adapted to any set of conditions and order them from the factory. When the dealer provides a mailing list the letters are written and sent with stamped envelopes to him for mailing to prospective tire buyers. The plant can print 200 different letters at a time and there are usually 500 or more waiting to be put on the presses.

## NEW HYATT BRANCH.

A branch of the Hyatt Roller Bearing Company, making 10 in all, has been established at Seattle, Wash. The branch is in charge of D. B. Bevier, formerly service manager of the company's branch at Los Angeles, who has been made district manager over all the company's branches on the Pacific Coast. J. J. Hanrahan, formerly service manager at San Francisco, has been transferred to Los Angeles, and F. B. Brunton has been made service manager of the San Francisco branch. The Seattle branch was opened April 1.

The establishment of the third branch on the Pacific Coast indicates the very general use of motor cars in that section of the country. The other Hyatt branches are at Atlanta, Boston, Chicago, Detroit, Los Angeles, Minneapolis, New York, San Francisco and at High Wycombe, London, England.

The following have recently made agency contracts with the H. J. Koehler S. G. Company of Newark, N. J.: J. H. Wilhelm, Myerstown, Penn.; Max Berdzi, New York City; P. V. Washburn & Son, Coxsackie, N. Y.; Central Garage, New Philadelphia, O.

### TRUCK 'BUSES RUN THROUGH STORM.

A snow storm so severe that it tied up trolley service at Seattle, Wash., and steam trains as well, did not prevent a fleet of 'buses in that city on Federal truck chassis from giving a usual service. The 'buses connect with the West Seattle ferry over substantially the same line as that taken by the Puget Sound Traction Company. The trucks are operated on a regular schedule and their dependable service and the comfort provided for passengers insures a capacity load at each trip. The cost of operation has proved to be much lower than was expected when the service was inaugurated.

### CAN DESIGN ENGINES FOR NEW FUELS.

If the high price of gasoline continues automobile engineers will have no difficulty in designing an engine that can operate on kerosene or some other fuel, according to Russell Huff, president of the Society of Automobile Engineers and chief engineer of Dodge Brothers. Engines for either kerosene or alcohol could be provided, but most purchasers prefer gasoline engines because they are used to that type and because distributing systems for that fuel are already well developed.

Gasoline, Mr. Huff, points out, is only one of several items of cost in operating an automobile. It is an important factor, but what the owner wants is a car with a low total cost of maintenance. This low cost is aided by the society's work in promoting the principles of standardization and interchangeable manufacture. This reduces the original price of the car as well as the cost of repairs and maintenance.

### TRUCK REPLACES ELECTRIC CAR.

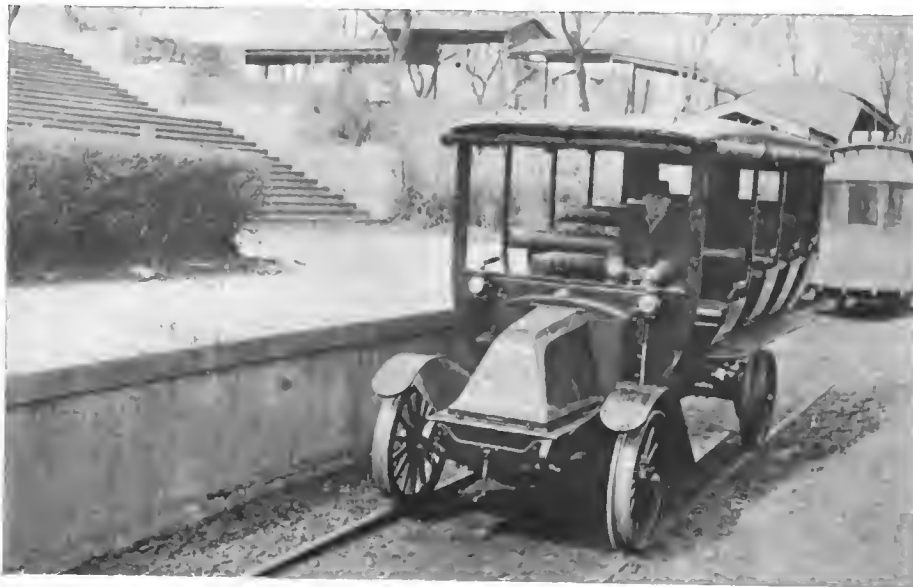
To take passengers from the Rock Island railroad station  $2\frac{1}{2}$  miles away the Midlothian Country Club of Chicago constructed a standard gauge railway over which an electric car was operated. Current supplied by a public service corporation cost about \$3.50 for the round trip. When the car was full the cost was not unreasonable, but when, as on week days, only a few people came on each train it was very high. Recently the club bought a one-ton International truck, put in a solid front axle, removed the steering gear and fitted flanged iron wheels. This carries the traffic when it is light and helps out when it is very heavy. It costs about 10 cents a round trip for gasoline and oil. Special turntables for the truck have been installed at each end of the line.

### TIME PAYMENT BUYING.

#### Plans for Releasing the Funds of the Dealers and Purchasers.

The Guaranty Securities Corporation of New York has been rapidly extending the operation of its time payment plan to additional makes of cars and is prepared to finance the purchase on time of motor cars in enormous quantities. The companies which are now represented in the plan are the Ford, Hudson, Studebaker, Paige, Chevrolet, Reo, Oakland, Overland, Buick, Chandler, Maxwell, Kissel, Oldsmobile, Willys-Knight, Cadillac, Chalmers, Dodge, Jeffery, Hupmobile, Mitchell and Franklin. It extends also to commercial bodies mounted on these chassis for business men.

The company takes over notes made by purchasers



International One-Ton Trucks, Fitted with Flanged Wheels, Operated on a Standard Gauge Railway for the Midlothian Country Clubs of Chicago.

for from 50 to  $66\frac{2}{3}$  per cent. of the price of the car. The purchaser pays  $2\frac{1}{2}$  per cent. of the car price to cover insurance and six per cent. on the notes he gives.

The Guaranty corporation buys the notes for their full face value from the dealer minus a small hold back—20 per cent. of the face value of the notes—which is paid when all the notes have been met. Collections on the notes are then made through the guaranty corporation by mail. The dealer retains the full amount of the down payment and receives, immediately the car leaves his floor, the cost price to him along with a portion of his profit.

The dealers' capital is not tied up and the car purchaser whose credit is good does not lose the use of his money. There are many people who wish to buy on such a plan as this and it is expected to greatly expand the motor car market. The list of cars that can be bought in such a way is so large that the customer has a wide range for selection.

## S. A. E. MID-SUMMER CRUISE.

### Many Reservations Made and Programme of Meetings Near Completion.

The committee in charge of the 1916 summer cruise of the Society of Automobile Engineers has already made 147 reservations for members and their guests who will take the outing. The steamer *Noronic* has accommodations for 550 and it is considered remarkable that a quarter of these should have been taken in two weeks. The capacity of the boat is expected to be sold before June 1.

Arrangements have been made to have the ship stop at Sarnia, Ontario, on the way back, so that those who wish may alight there and take trains East. Detroit will be crowded the week of the cruise with other conventions and arrangements have been made with the steamship company to allow the engineers to sleep on the ship the night of its return to Detroit provided they cannot secure hotel accommodations.

K. W. Zimmerschied, chairman of the papers com-

## FARM FIELD FOR MOTOR TRUCKS.

Every farmer is a prospect for a motor truck, according to W. O. Duntley, president of the Chicago Pneumatic Tool Company, which makes Little Giant trucks. He calls attention to the fact that Dr. King of the University of Pennsylvania has figured that it costs \$75,000,000 a year to get products from the farm to the railroad station, and that it costs only four cents more to send them from Chicago to Liverpool than it does to haul them from farm to town.

H. E. Scholl, a farmer 35 miles from Santa Ana, Cal., was making only a bare living four years ago when he invested in a Little Giant truck, but it has enabled him to gain real prosperity.

## URGES MOTOR TRUCK RESERVE.

The Smith-Form-a-Truck Company is calling the attention of Chicago automobile owners who have cars that can be fitted with truck bodies, to the assistance they would be able to offer the government if



**Knox Tractor with a Steel Girder 60 Feet Length and Weighing 31,000 Pounds. That Was Hauled 3.2 Miles in 18 Minutes.**

mittee, has already made much progress in formulating the technical programme for the meeting. Some of the subjects will be the design of agricultural tractors, aeroplane motors and problems connected with motor trucks and military transport and the possibility of using kerosene motors in automobiles. The question of carburetion which the fuel situation makes important will receive attention. A session will be given over to a discussion of high speed motors. Motor fuels will be considered at another session.

Howard Coffin, member of the naval consulting board, will read a paper on preparedness. J. H. Hale of the Goodyear Tire and Rubber Company will read a paper on straight side versus clincher tires. C. M. Eason of the Hyatt Roller Bearing Company will discuss engines for farm tractors. H. D. Church of the Packard company will discuss trucks, and E. A. Nelson will deal with pressed steel construction in trucks.

The Singleton-Tripp Company, advertising agent, Citizens' building, Cleveland, O., announces the change of its name to the Singleton-Hunting Company.

they organized a Motor Reserve Corps such as motor vehicle owners in Los Angeles and New York have formed. Each company would be equipped with machines of the same model. In the event that the government had need for the trucks these could be converted in factories with which arrangements have already been made. Firms operating trucks are asked to join the movement, which is being promoted by the National Committee of Home Defense.

## TRACTOR HAULS 60-FOOT STEEL GIRDER.

With a Knox tractor a steel girder 60 feet length, 57 inches width and weighing 31,000 pounds was hauled three and a fifth miles from a steel works to the place of construction in Detroit in 18 minutes, which is probably a record for haulage of such weight. The work was done by E. T. Towar & Co., motor transportation engineer. The preparations for the work required much longer time, as did the unloading, but the big piece of metal was handled as easily in traffic as an ordinary load. Once the tractor was stopped in less than its length while moving 10 miles an hour.



## TWO SIZES AND THREE TYPES OF GLOBE TRUCKS.

**M**AINTAINING that there is greater efficiency and economy in the six-cylinder engined truck because of the increased flexibility and its more uniform torque when power is needed, the Globe Motor Truck Company, Northville, Mich., a concern recently

ments of the largest number of business men—that is, the class of buyers who could utilize trucks in service extending over large areas and who required comparatively long mileages. Conclusion was reached that the market that this class would represent would be

considerably in excess of 50 per cent. of all engaged in or requiring haulage, and the type of vehicle that would best serve and would be favored by the greatest number was carefully considered.

Instead of one type, however, what might be regarded as a class was determined, this being two sizes, 1500 and 2000 pounds load capacities, and two designs, the 1500-pound machine being driven by internal gears and the 2000-pound truck being either internal gear or worm and worm gear

driven. Beyond this the decision was reached to give an option of the type of internal gear, so that, with Globe trucks, the buyer had a wider range of choice than with any other small type in the market.

The Globe trucks are not differentiated save by capacity and, with the larger size, by the system of power transmission. The buyer of the 1500-pound machine can choose either the Russel or the Celfor internal gear axle, and if considering the 2000-pound machine he has a choice of the Russel or Celfor internal gear axle or the Timken. Aside from the transmission systems the machines do not greatly differ. There is but one size of engine used, this being the Continental model 7W, which has cylinder bore of  $3\frac{1}{4}$  inches and stroke of  $4\frac{1}{2}$  inches, and in general characteristics the machines are very similar, but the parts of the 2000-pound vehicles are in some instances larger than those of the 1500-pound trucks.

### Small Continental "Six" Engine.

The Continental 7W engine is the smallest type of the kind that the maker produces and it is rated at



The Globe 2000-Pound Chassis with Russel Internal Gear Axle, Equipped with a Standard Type of Platform Stake Body.

established in the industry, is now producing machines of this type that are constructed of units recognized as standards, and which are used by a considerable number of companies.

Six-cylinder engines are not often used for trucks. There has been no question by engineers of the superiority of this type of engine as compared with four-cylinder types, but as a rule the object sought has been simplification, and claim has been made that the four-cylinder engine has sufficient capacity and meets all normal requirements and has fewer parts.

The contention of the engineer who designed the Globe trucks is that while the power production of the six-cylinder engine is not larger than a four-cylinder, the better application of this power is practical and desirable and can be obtained without increase of fuel consumption, so that the owner has a reserve that is always available in the event of road conditions that are unfavorable, while on good highways only the minimum of gasoline is used.

The Globe Motor Truck Company was organized and is controlled by the same interests who operate the Globe Furniture Company, a concern that has been active for 40 years, and which has specialized its production. The possibilities from specialization were well understood, and this knowledge undoubtedly prompted the formation of the company to build a type of machine for which there is believed to be a very general demand.

The company's engineer advised the building of a machine that in load capacity would meet require-



Globe Six-Cylinder Truck Chassis with Russel Internal Gear Axle and a Standard Express Flareboard Type Body.

25.40 by the S. A. E. formula, but at 2000 revolutions a minute the brake horsepower developed is claimed to be 38, which is much in excess of any requirement in anything like normal service. It is a four-cycle, water cooled, vertical, L head type.

The design of this engine differs considerably from the four-cylinder types ordinarily used as power plants for trucks. Substantiability has been the main purpose and it is a removable head construction with the cylinders cast en bloc. The cylinder unit is cast from a fine quality of gray iron with the water jacket and the upper section of the crank case integral, with forward and rear extensions. The water jacket is large to obtain positive cooling and the design is such that after casting the water passages may be freed of all obstructions to efficient circulation. In this casting the fuel intake manifold is integral and this is so located that the gas is carried through a passage heated by the cooling system so that the carburetion will be promoted.

The casting has a central transverse vertical web that carries centre main bearing, and there are webs beneath the valve pockets so that the valve mechanism may be enclosed. The forward extension of the crank case forms a part of the housing for the timing gearset, and the rear extension is shaped so that the removable bell housing for the flywheel may be attached by bolts, or the engine may be independent of the transmission gearset. The engine head is a casting that carries the water jacket for the combustion chambers, having a longitudinal channel into which, near the forward end, the water outlet is fitted, this insuring the flow of the water so as to thoroughly cool the head. The casting is so formed that the water passages may be completely cleared. This head is

attached to the cylinder block by a series of cap screws and is fitted with a gasket, so that there is a gas and water tight joint. The head may be easily and quickly removed for valve grinding or cleaning the deposits of carbon.

The engine block is first tested with water pressure to determine leakage and defects and is then rough bored, after which it is aged to obviate distortion from machining strains. A second water pressure test is given and then the cylinders are finish bored. Much care is taken to free the water passages thoroughly. The casting requires much careful machine work to finish it.

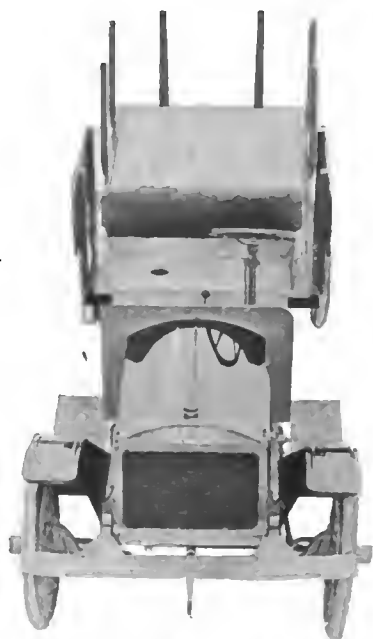
#### Pistons Have Two Rings Each.

The pistons are cast from the same quality of iron as the cylinders and the skirts are  $3\frac{1}{2}$  inches length to insure against side pressure. The pistons are turned and cut with oil grooves and channels for two  $\frac{1}{4}$ -inch concentric expansion rings. The pistons, after turning, are accurately ground to size. The rings are specially machined to relieve all strains and are ground on both faces and sides. Unusual care is taken in fitting the rings to the pistons.

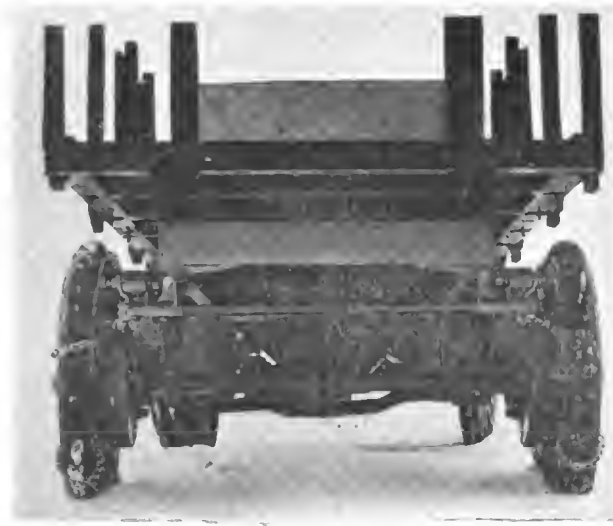
The lower section of the crank case, which serves as an oil pan and reservoir, is formed of pressed steel, this construction being extremely light and strong and quickly removable for examination of or work on the main or the connecting rod bearings.

#### Three-Bearing Crankshaft.

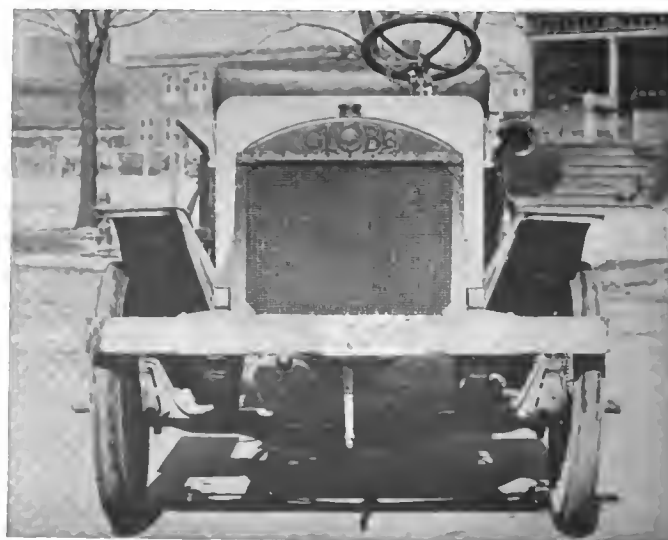
The crankshaft is a three-bearing type, made of a special steel drop forging that is heat treated to obtain a tensile strength of 100,000 pounds to the square inch. The flywheel flange is forged integral and there are flanges at either side of the front bearing to take end thrust. The crankshaft bearings, from front to



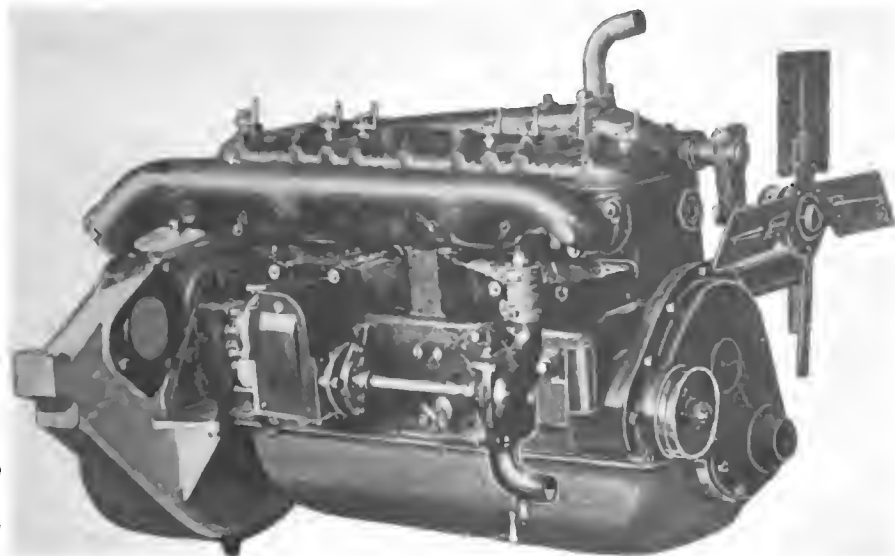
Globe Truck Chassis and Stake Platform Body, Seen from an Elevation.



Rear End of Globe 2000-Pound Chassis Showing the Russell Internal Gear Axle and General Construction.



Front of Globe Six-Cylinder Truck Chassis, the Frame Being Protected by a Wide Bumper and the Radiator on Springs.



Valve Side of the Six-Cylinder Continental Engine, with Water Pump and Magneto Installed, Used in Globe Trucks.

rear, are  $2 \frac{9}{32}$ ,  $2 \frac{1}{4}$  and  $2 \frac{7}{32}$  inches diameter, and are  $2 \frac{1}{2}$ ,  $2 \frac{7}{8}$  and  $2 \frac{1}{2}$  inches length respectively.

The camshaft is drop forged from low carbon steel with the cams integral with the shaft. It is first turned and after the cams have been rough machined and annealed is subjected to a special process of heat treating. It is then finish ground on a special camshaft grinding machine. The camshaft is one-inch diameter and the bearings from front to rear are respectively  $1 \frac{7}{8}$ ,  $1 \frac{13}{16}$  and  $1 \frac{11}{16}$  diameter, and are  $2 \frac{1}{2}$ ,  $2 \frac{3}{8}$  and  $2 \frac{1}{2}$  inches length. The camshaft may be withdrawn from the engine by simply removing the cover of the timing gearset case.

#### Bearings Are Nickel Babbitt.

The crankshaft, camshaft and the connecting rod big end bearings are high-grade nickel babbitt and the crankshaft and camshaft bearings are mounted in bronze cages. All the bearings, after being fitted, are expanded with expansion arbors and are reamed and finished with a slow running, spiral cut power burrisher. The connecting rods are I section steel drop forgings that are heat treated and are bored and reamed on special machines to insure correct centres and alignment. The caps of the connecting rods are

retained by nickel steel bolts and the bearings are adjustable with steel shims. The wristpins are steel tube that is hardened and ground and are secured in the piston bosses by locking devices, and the large bronze bushings of the small ends of the connecting rods are pressed into them.

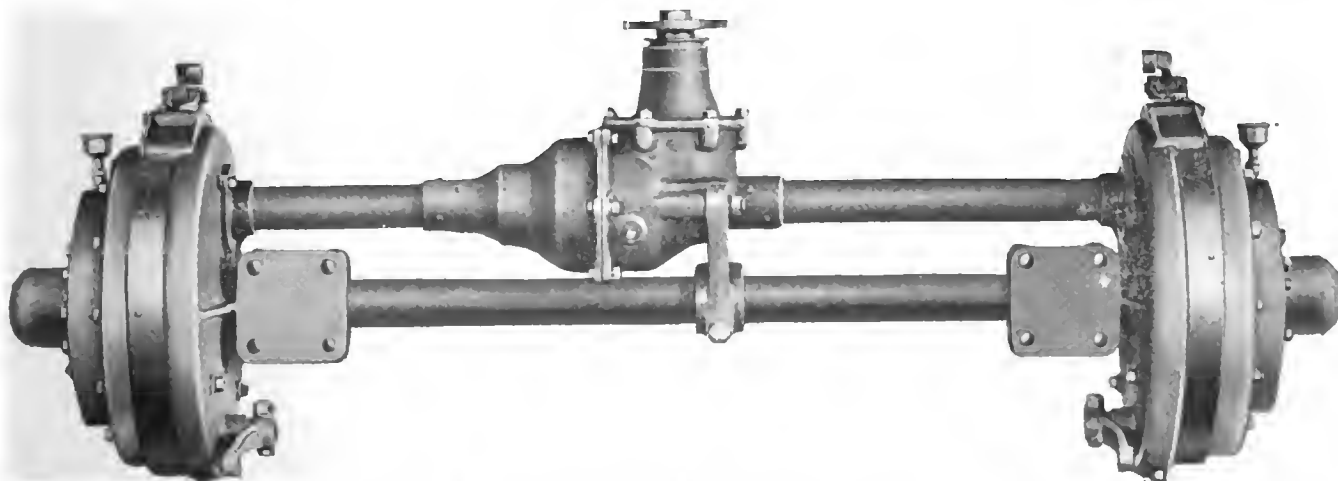
The valves are at the right side of the engine and the ports are generous of size and are fitted with interchangeable valves with nickel steel heads and carbon steel heads, that are electrically welded. The valves are ground to exact size. The valve clearance is large to insure complete cleaning of the cylinders and full charges of fuel. The valves are actuated by

mush room type tappets of special type, ground to size, that are adjusted by hardened screws and nuts. The ends of the valve stems are hardened to prevent wear.

The timing gearset consists of crankshaft, camshaft and pump shaft gears that are housed in a covered front extension of the engine case. The gears are wide and are helical cut, much care being given to the accuracy of gear centres.

#### Lubricating and Cooling Systems.

The engine is lubricated by a combination force feed and splash system. A horizontal plunger pump, driven by an eccentric from the camshaft, draws the oil from the reservoir in the base of the crank case and forces it through copper tube to the timing gearset and the main bearings. The excess drains to the oil pan, filling the troughs, into which the big ends of the connecting rods sweep, splash distribution lubricating the cylinders, pistons, wristpins, camshaft and tappets. Lubricant for the camshaft bearings is trapped in pockets formed in the wall of the crank case, and lubricant for the wristpins is trapped in openings in the upper ends of the connecting rods. After flooding the troughs the oil drains to the reservoir, where it is



Russel Internal Gear Axle, Choice of Which, or a Celfor Internal Gear Axle or a Timken Worm Axle, Is Open to Buyers of Globe Trucks, Who Have Option for Both Sizes of Machines.

filtered before being again circulated. The oil filter can be removed for cleaning and the oil reservoir can be drained when desired.

The engine is cooled by a circulation of water through the jackets, which is forced by a centrifugal pump driven by shaft from the timing gearset. The pump has two large stuffing boxes and can be drained as desired. The pump has two unusually large bearings. The water is forced through a Long radiator of the "built-up" type that is mounted on springs on the chassis frame, and radiation is promoted by a large fan that is on a ball bearing carried on an adjustable bracket at the front end of the engine block. The fan is driven by flat belt from a pulley on the water pump shaft. The ignition is by a high-tension system with a Splitdorf-Dixie magneto as the source of the current supply, which is used with a fixed spark, and the carburetor is a Master, an automatic float feed type.

#### **The Power Transmission System.**

The clutch is a dry disc type, consisting of 13 plates of ample area, that is said to be very easy of engagement and extremely efficient in all operating conditions. The transmission gearset is a sliding gear selective construction that affords three forward speeds and reverse, that has large gears and shafts and is fitted with bearings that are designed for hard service. The gearset and the clutch are enclosed in a housing that is bolted to the rear extension of the engine case. The assembly of engine, clutch and gearset is mounted as a unit at three points, being supported by a trunnion at the forward end of the engine case that is carried in a heavy drop forged steel yoke, the ends of which are mounted on the side members of the chassis frame, and from the chassis frame side members by arms formed integral with the bell housing of the flywheel. This suspension insures against stresses resulting from distortion of the frame.

The power is transmitted from the gearset to the rear axle by a tubular shaft  $1\frac{3}{4}$  inches diameter, with universal joints at either end, and coupled to the pinion shaft of the internal gear drive axle or to the worm shaft of the Timken axle. The buyer of the 1500-pound load capacity truck has choice of either the Russel or the Celfor axle, and of the 2000-pound load capacity truck choice of either of these or the worm driven axle. One description of the internal gear axles will suffice for both machines.

#### **The Internal Gear Drive Axles.**

The principles of construction of these are very similar, the main difference being in the form of the solid or load carrying axle member, which in the Russel design is round and in the Celfor is an I beam with an expanded centre that is formed to have a trussing or "bridging" effect. The jackshafts of both axles are both carried forward on the "dead" axle, that of the Russel design being mounted at either end of the spiders or flanges that carry the brake shoes and brake shafts and form the covers of the internal gears and driving pinions, and by a heavy bracket that clamps the "dead" axle and a lug on the differential housing

of the jackshaft; the Celfor axle jackshaft is similarly supported at the ends, but the differential housing is secured to the expanded centre of the "dead" axle by four bolts.

The principle of driving the axles is precisely the same, the pinion shafts carrying bevel gears that turn the small master gears that are beside the differential gearsets in the Russel axles, and which are concentric with the differential gearsets of the Celfor axles, but are offset and are driven by larger pinions. The spur pinions at the outboard ends of the jackshafts are meshed with spur internal ring gears that are bolted to the rear wheels and these are enclosed by steel drums on which the emergency brake shoes contract and within which the shoes of the service brake expand. The gear reduction at the driving pinions and master gears are comparatively small, but the main reduction is obtained by the ratio of the spur pinions at the ends of the jackshafts and of the internal ring gears.

#### **High Speed of Light Parts.**

Because no loads are upon the jackshafts, and the power can be obtained through higher speed and the large gear reduction, the weights of the jackshaft are much smaller than with any other type in which the driving axles carry the loads. The axles are constructed with ample ball and roller bearings and very careful provision has been made to insure lubrication, so that friction is reduced to minimum. Claim is made for these axles that the power is very economically and efficiently applied, and that they are, because of the design, very enduring and require practically no attention other than lubrication.

The Timken worm axle is the standard full floating David Brown design, with the housing in three sections, the central section enclosing the differential gearset, and the end sections, reinforced by steel tube that carry the wheel bearings, bolted to it and trussed. The worm shaft, the worm wheel and the bevel differential gearset are assembled as a unit on the cover plate of the centre section. The differential gearset is mounted on spiders, and when the driving axles are withdrawn the cover may be removed with the entire assembly. The axle is fitted throughout with Timken roller bearings and the lubrication is by oil that is carried in the central part of the housing.

#### **Choice of Front Axles.**

The purchaser has the option of either Sheldon or Timken front axles, these being steel drop forged I sections, with heavy steering knuckles and large wheel spindles of chrome nickel steel and fitted with roller bearings. All parts of these axles are heat treated. The frames are of pressed steel channel section of liberal dimensions. The frames are suspended on semi-elliptic springs, the rear set having two main leaves of chrome nickel steel that are wrapped about the eyes, and all spring eyes bronze bushed. There is a special steel reinforcing band at the centre of each spring. The torque and the braking stresses are taken by the forward ends of the springs, which are pivoted to

heavy hangers, this being the well known Hotchkiss method of drive which has been very generally adopted by foreign truck builders.

#### Wheels and Control Members.

The wheelbase of both sizes of trucks is 126 inches and the tread is 56 inches. The wheels are artillery type, having 14 spokes each, those of the 1500-pound machine being  $1\frac{3}{4}$  inch and those of the larger truck two inches. These are shod with 34-inch solid band tires, three and  $3\frac{1}{2}$  inches respectively for the front and rear wheels of the light vehicle, and  $3\frac{1}{2}$  and four inches for the larger. The steering gear is a worm and nut type, located at the left side, with heavy linkage and adequate provision made for adjustment for wear. The emergency brakes are internal expanding within the steel drums on the rear wheels. The service brakes are external contracting on the wheel drums. The brakes are all equalized. The control is by the usual clutch and service brake pedals, by the gear shifting and emergency brake hand levers located in the centre of the footboards, and by hand throttles on the steering wheels.

The gasoline tanks have capacity of 16 gallons and are located under the drivers' seats. The regular equipment of the chassis includes oil dash and tail lamps, seats, front fenders, horns, tool boxes, tool kits, jacks, etc., and when desired electric lighting and starting systems are installed as extras. Bodies, either platform or stake types, which have 98 inches space behind the drivers' seats, are furnished at moderate prices when desired by the purchasers.

In the building of the machines great care has been taken to obtain simplicity and accessibility, so that there will be minimum labor required to afford attention, all moving parts are carefully protected, and lubrication has been provided for by large oil and grease cups.

#### GAS COMPANY BUYS 22 INTERNATIONALS.

The accompanying photograph of a line of 22 model M 2000-pound International trucks was made before one of the buildings of the motor truck plant of the International Harvester Company at Akron, O., before the shipment of the machines to the purchaser, the People's Gas, Light and Coke Company of Chicago.

go. The purchaser is one of the largest public service corporations in the country and has large transportation requirements in connection with construction and maintenance of its system for the distribution of gas.

The company is gradually replacing with motor trucks all of its horse drawn equipment, and in following this policy placed the order with the International Harvester Company, which delivered the machines at one time. The trucks are standard chassis equipped with standing covers, and while there are no unusual features, practical and enduring service were essentials for the bodies.

The photograph was taken in front of the plant of the manufacturer at Akron, O., which is claimed to be the largest in America devoted exclusively to building trucks. All the buildings are new, of concrete and steel, and are splendidly equipped with machine tools and facilities for production.

#### EXPECT STEEL PRICES TO TURN.

For the first time the steel companies in the Pittsburgh district are finding some reluctance on the part of customers to place orders for deliveries far in the future at the present abnormally high prices. Many concerns state that they prefer to take their chances on price and delivery at the time when the material becomes necessary for their use. The feeling is beginning to develop that the present high prices cannot long be maintained and that with the declaration of peace in Europe, which may be before the first of the year, values are likely to slump rapidly.

#### RAILROADS FAVOR HIGH DEMURRAGE.

While some improvement in the freight car famine has been noticeable at Detroit during the past few weeks, the shortage is still acute. The railroads have talked of assessing a \$5 a day demurrage rate on automobile cars, but this has been deferred by promises by the automobile interests that they would influence their dealers to unload all cars as rapidly as possible. The railroads still complain, however, of much delay in taking the automobiles off the cars at destinations.



Fleet of International Model M Trucks for the People's Gas, Light and Coke Company, Chicago, Ready for Shipment from the Akron, O., Factory of the International Harvester Company.



## STERLING MOTOR "SQUEEGEE" STREET CLEANER.

**S**ANITARY equipment for cleaning streets, which is constructed on a different principle from the usual types of horse drawn or motor driven street cleaning apparatus, has been designed and is being sold by the Sterling Motor Truck Company of Milwaukee, Wis. It is mounted on the company's worm drive truck chassis.

This machine combines the flusher, sweeper and a third cleaning device, known as a squeegee, which cleans the pavement after the manner of the rubber instrument used for brushing water from windows in the cleaning operation.

The great advantage of the machine is that it cleans more thoroughly than does the old style rotary brush or the flusher, since it not only moves the unattached dirt which the brush or flusher would reach, but it removes much that would ordinarily adhere to the pavement.



**Sterling Worm Driven Chassis Equipped for Flushing, Sweeping and Washing Streets—A New Device for Municipal Sanitary Departments.**

The increasing traffic on city streets, as well as the keener realization everywhere of the necessity of clean thoroughfares to promote the health of communities, has brought the subject of highway sanitation more into prominence of recent years than ever before.

The Sterling equipment is the only washer of the kind that has ever been designed or built, yet the principles of construction have been amply proven by work in the leading cities of the United States and Europe.

### **Has 1000-Gallon Tank Capacity.**

The chassis carries a 1000-gallon oval shaped steel tank. Immediately in front of the front fenders of the chassis are two flusher nozzles. These are controlled by levers from the driver's seat.

By wetting the street the flushers prevent dust being raised and they quickly wash away the greater part of the loose dirt that lies on the surface of the pavement. Supplementing the flushers and immediately behind them, are heavy pavement sweeping brooms, which further loosen the dirt and sweep to one side

refuse in large sized pieces which might interfere with the operation of the squeegee, as the rubber roller is called.

Mounted near the centre of the chassis frame and underneath it is the spiral shaped squeegee roller, which washes the street. This roller is 19 inches diameter and eight feet long. The rubber lobes on this roller are made of specially treated long wearing rubber and each is individually detachable. They are mounted in special kiln dried wood holders of large wearing surface. They are adjustable as they wear down, so that additional surface can be brought in contact with the pavement.

### **Squeegee Is Flexibly Mounted.**

The squeegee attachment is flexibly mounted and counter-balanced in such a way that when it is adjusted to a certain pressure it is impossible for the roller to work loose and the pressure against the surface of the street is uniform, the rubber strips being six inches deep and affording a large wearing surface.

A toggle joint linkage terminating in a lever at the driver's seat enables him to easily put the squeegee in or out of use. The tank is fitted with a water meter, which shows the amount of water that goes through it. The water meter indicates the work done by the driver and also gives a basis for data on the quantity of water required for various street surfaces under different conditions. The tank contains four valves near the front end for distributing water ahead of the machine and to the

side nozzles near the squeegee roller.

The steel tank of oval shape is supported on the chassis in four U-shaped cradles with four equally spaced bands over it to hold it in place. The capacity of the tank is sufficient for washing from 3500 to 5000 square yards of pavement, according to its condition.

The squeegee roller is driven from the secondary shaft of the transmission gearset. This drives a worm and a wheel on the same shaft drives another shaft equipped with a sprocket to drive the roller.

In a day's work the machine can wash from 80,000 to 115,000 square yards of pavement, according to whether it is smooth or rough. This is about 25 miles a day or the equivalent of the work of from three to six animal drawn equipments. The outfit runs at an average speed of seven miles an hour. Such a speed gives the best results both in the cleaning and the life of the rubber pads on the Squeegee Roller. The truck can be turned in a 48-foot circle and can be operated in narrow streets.

The chassis is a standard type of worm drive construction. The motor is a four-cylinder type with  $4\frac{1}{4}$ -inch bore and  $5\frac{3}{4}$ -inch stroke. The cylinders are L head, cast in pairs, with valves on the right side. The crankshaft is a large, three-bearing construction, tested to maximum strains of 140,000 pounds per square inch. Its normal speed is 1040 revolutions a minute and this speed is controlled by a centrifugal governor. The carburetor is a Holley springless type, which does not require adjustment after it is once set and is provided with a means of regulating the temperature. Unit power plant construction is employed, the motor being combined with the clutch and the transmission gearset, and this is mounted on three points.

The cooling system consists of a cast aluminum tank with a removable radiating core of individual finned tubes. By unbolting the tanks the core can be quickly demounted and damaged portions of the radiator repaired. A multiple dry disc type clutch, with plate faced with Raybestos, is used. The sliding gear transmission gearset has three speeds forward and reverse.

The worm driven rear axle is equipped with a straight type worm. It is enclosed, is dust and oil proof and quickly accessible. There is a straight line drive between the transmission gearset and the axle.

Both the service and the emergency brakes are internal expanding upon drums on the rear wheels which are 20 by seven inches. The frame is made of heavy seven-inch pressed steel with members bolted solidly together. The wood inlaid frame prevents crystallization and lessens noise. The wheelbase is 158 inches. The width of the wheels over all is 60 inches in front and 66 inches in the rear. The front tires are 36 by four-inch single and the rear tires are 36 by five inches dual. When the truck is under load 90 per cent. of the paying weight is on the rear axle. The fuel tank holds  $22\frac{1}{2}$  gallons.

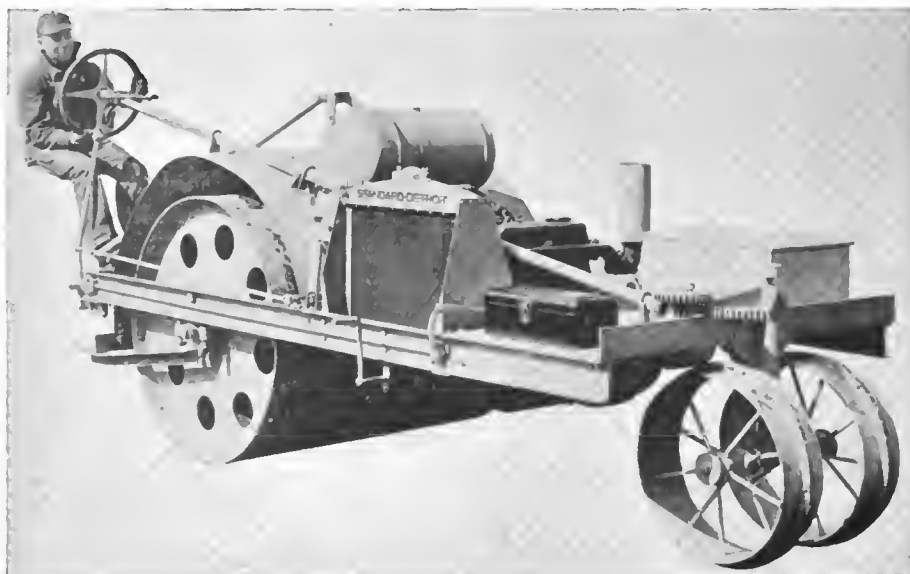
The standard equipment includes a steel cab with a top, fore doors, storm curtains, upholstered cushions and seat, special truck type windshield, side and tail oil lamps, horn, complete set of tools, jack and a hub mileage recorder.

A contractor who saw a team of horses hauling a yard of clay out of an excavation and then hauling this small load four miles, because the animals could pull no greater one out of the hole, decided to have the loads transferred from the horse wagons to trucks as soon as the wagons reached the level ground. He made a great saving and the system is being rapidly adopted by others.

## STANDARD DETROIT TRACTOR.

### New Machine on Automobile Lines and Principally of Standard Parts.

The Standard-Detroit Tractor Company, Detroit, Mich., is now ready to produce commercially a type of farm tractor that is different from those that have been developed for agricultural work in that it follows to a considerable extent automobile practise, and it is largely built of what are regarded as standard parts in the automobile industry. The machine was designed by George S. Jacobs, and more than two years' time was devoted to experimentation before it was believed the machine was perfected. The tractor has been tried on farms in the vicinity of Detroit and has proven durable, economical and highly efficient, according to those who have closely observed it. The tractor will do the work for which several horses



The Standard-Detroit Farm Tractor, a Machine Built Largely of Standard Parts and on Automobile Lines.

would be required and the upkeep is comparatively much less than teams.

Mr. Jacobs has had many years' experience with farm tractors and he believes that the machine is a decided progression. The engine is a valve-in-the-head type and it is combined with the clutch and transmission gearset in a single unit that is fully enclosed and so suspended in the frame that the bearings are always in alignment. The engine, clutch and gearset are lubricated from a single source.

Three controls are used in the operation of the tractor, there being one hand lever that is used for ordinary driving and this automatically disengages the gears and engages the clutch for belt work. The radiator is very large for the motor, which is rated at a maximum capacity of 20 horsepower, and is a cast tank type. All moving parts of the machine are enclosed and thoroughly lubricated. Much care has been taken to have all parts easily accessible for adjustment or

repair. The tractor weighs 3900 pounds, has a draw bar pull of 2000 pounds and it is to be sold for \$1065.

The fact that most of the members of the company are identified with the automobile industry is probably a reason why automobile parts, so far as possible, are used in the construction of the tractor. The president of the company is Martin L. Pulcher, vice president and general manager of the Federal Motor Truck Company; Charles F. Mellish is vice president, Frank G. Jacobs is secretary, L. W. Goodenough is treasurer, and the directors include Thomas E. Roeder, president of the Federal Motor Truck Company; A. R. Demory, vice president of the Timken Roller Bearing Company, and E. P. Hammond, president of the Gemmer Manufacturing Company. The company is located in a factory at 1506 West Fort street, Detroit, and the plant has been equipped and is now being operated to capacity. Inquiries concerning the machine have been received from practically every state in the nation.

#### WHITE COMPANY DIRECTORS.

Directors of the White Motor Company were elected at the annual meeting of the stockholders held in Cleveland, April 8. The following were chosen: Windsor T. White, Walter C. White, A. R. Warner, E. W. Hulet, Otto Miller, M. B. Johnson and J. R. Nutt of Cleveland, and J. Horace Harding, A. Mitchell Hall, 2nd., Theodore Roosevelt, Jr., and E. R. Tinker of New York. At the first meeting of the directors the following officers were elected: Windsor T. White, president; Walter C. White, first vice president E. W. Hulet, second vice president; M. B. Johnson, chairman of the board; Otto Miller, treasurer; A. R. Warner, secretary and assistant treasurer. The White Motor Company has taken over all the assets of the White company with the exception of \$500,000, and the capital of the White company has been reduced to that amount. All the capital stock of the White company is owned by the White Motor Company and the former will be continued as the selling organization of the latter.

#### ALLIS-CHALMERS BUSINESS IMPROVES.

The business of the Allis-Chalmers company of Milwaukee, Wis., is running at \$1,500,000 gross monthly, exclusive of war orders. This firm manufactures, in addition to many other lines of machinery, farm tractors and various automobile products. Its net earnings will amount to about \$4,000,000 for the year and will enable it to pay off some back dividends on its preferred stock.

The Four Wheel Tractor Company has been organized in Clintonville, Wis., by interests associated with the Four Wheel Drive Truck Company. Stock is being sold to acquire a plant and begin the production of tractors.

#### FIRE LOSSES AT EXPOSITIONS.

The American-La France Fire Apparatus Company, which provided the fire protection for the San Francisco Exposition, has issued a table showing the work of the fire departments at three great American expositions, Chicago, St. Louis and San Francisco.

The table follows:

	Alarms	Losses
Chicago .....	75	478,000
St. Louis.....	350	100,000
San Francisco.....	117	250

This probably indicates much development in fire prevention methods since the earlier expositions were held, as well as the greatly increased efficiency of the motor over the horse drawn fire apparatus. Motor apparatus was not available at the earlier expositions. All exposition buildings are constructed largely of wood and are very inflammable.

#### PREMIER ORGANIZATION COMPLETE.

The Premier Motor Corporation, which will make the Mais truck, as well as passenger cars, has completed its organization. It starts with a capital of \$2,500,000. The officers elected are J. C. Flowers, president; F. E. Smith and E. W. Steinhart, vice presidents; C. F. Jensen, secretary; H. L. Thompson, treasurer. The department heads are P. D. Stubbs, director of sales; Homer McKee, advertising manager; P. W. Tracy, purchasing agent; E. G. Gunn, chief engineer; F. P. Nehrbas, factory production manager; C. S. Crawford, associate engineer, and J. L. Yarian, associate engineer.

#### WON'T BUY ASSEMBLED TRUCKS.

The supply committee which decides on specifications for equipment to be purchased by the Federal government has inserted a clause in the conditions for bidders to the effect that for the next year the government will buy no trucks for the postal or other services that are assembled machines. This is causing truck makers some uneasiness because of its vagueness. Very few if any manufacturers make every part that goes into their trucks and the question is: Where will the committee draw the line. The provision might be used, if the committee desired, to refuse to consider the bids of any manufacturer who is not favored.

#### "BROADSIDE" ON KNOX TRACTORS.

A broadside folder picturing the new Knox model 35 four-wheeled tractor has been issued by the Knox Motor Associates, Springfield, Mass. The folder shows a large number of uses made of tractors for heavy haulage since these machines were put in the market about a year ago. It contains a very complete discussion of the construction of the tractor and of the principles to which it is built.

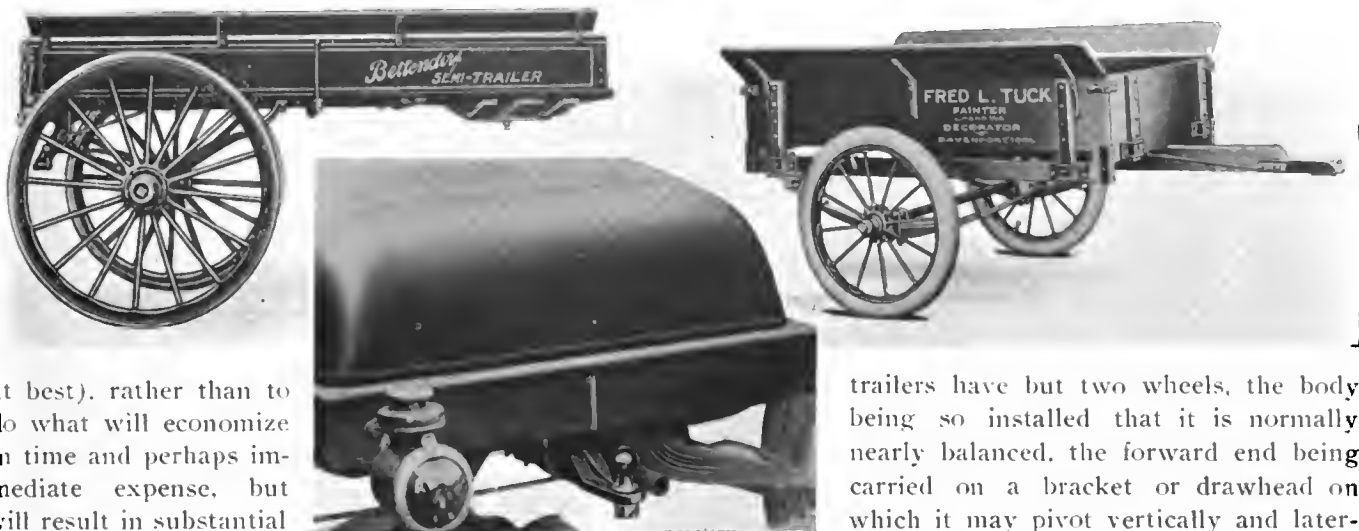
## BETTENDORF TRAILERS AND SEMI-TRAILERS.

**R**EGARDED from the aspect of the business man, the use of a trailer with either a pleasure car or a truck makes strong appeal because he can readily understand the possibilities of such a vehicle as compared with the equipment he has in service. Thousands use pleasure cars to do what may be defined as light work because they can save time, but in any event these machines are not satisfactory because they have very little space aside from the seats for the passengers, and only small freights can be carried, while freightage is quickly destructive of the finish and upholstery.

The man with a pleasure car in good condition hesitates to use it for such work because of the desire to have a car look well, and there is a very general inclination to buy small power wagons, or convert pleasure cars to business uses (which is a makeshift

endurance, and require comparatively little attention. Such trailers or semi-trailers, with a pleasure car as a tractor, are suited for what may be said to be considered rapid haulage. The bodies are mounted on springs and the wheels are equipped with either pneumatic or solid tires, according to the size and the work. They may be loaded with any form of freight, and because they are low are quickly accessible for loading or unloading.

The type of body depends largely upon the use to be made of the vehicle, and it may be so constructed that it can be covered to protect the load, even if continuously exposed to a storm. When of small capacities the bodies are usually open, but when large, permanent covers or tops are installed. These small trailers are divided into two classes, those mounted on two wheels and those on four wheels, while semi-



at best), rather than to do what will economize in time and perhaps immediate expense, but will result in substantial loss through the quick deterioration of the vehicle.

Many men cannot afford to maintain both a pleasure car and a truck. The car may be a luxury or a convenience, but when business is to be considered, quick transportation is a necessity. Needs may not be sufficient to justify owning both a car and a truck, and yet neither vehicle alone will adequately serve. A single machine that would have utility of both car and truck would be ideal, yet this can only be obtained in part by interchangeable bodies fitted to the pleasure car chassis. But changing bodies is not always practical, time is required for conversion and at best a car chassis will not long endure hauling heavy loads.

### Utilities of Trailers and Semi-Trailers.

This condition, however, can be met very satisfactorily and economically by the use of trailers or semi-trailers that can be drawn at comparatively high speeds for freight carrying vehicles, have sufficient capacities for moderate loads, can be quickly coupled and uncoupled, are substantially built and have long

trailers have but two wheels, the body being so installed that it is normally nearly balanced, the forward end being carried on a bracket or drawhead on which it may pivot vertically and laterally while being drawn, so that there may be no stresses upon frames while turning or from inequalities of the road surfaces.

When of larger sizes the semi-trailers are so designed that the greater part of the load, from 60 to 80 per cent., is carried on the axle, and the remainder on the rear axle of the machine drawing it. These are intended for use with trucks or tractors, and to the present time these have been constructed with capacity of 30,000 pounds or more. This applies to a single body. When used with trains of trailers the loads may be in excess of 40 tons, the total freightage depending upon the type and size of the units of the train and the road conditions on which they are operated.

### Bettendorf Light Trailers.

The Bettendorf Trailer Company, Bettendorf, Ia., now manufactures a series of trailers of the two-wheeled class designed for use with pleasure cars, that are of two types, and intended to increase this series so that it will have vehicles for practically every pur-

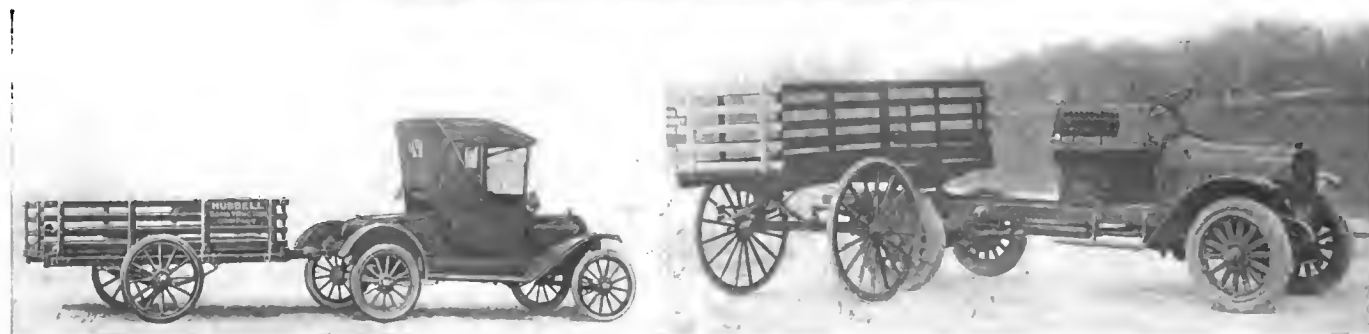
pose for which semi-trailers can be used. The trailers first constructed are mounted on two wheels, the bodies being so installed that they are nearly balanced when the loads are equally distributed, so that comparatively little weight is carried by the pole or draw-bar, and the trailers may be coupled or uncoupled when loaded by a man of normal strength without excessive labor. These were supplemented by a type of semi-trailer that is mounted on two wheels, but these are designed to have the forward ends carried on the rear deck or frame of a pleasure car chassis, and have somewhat larger capacity. The trailers are model F, with capacity of 800 pounds, and model S with capacity of 1200 pounds, while the semi-trailer has capacity of 1500 pounds.

The Bettendorf trailers and semi-trailers have been developed with a view to giving the owner of a pleasure car the same haulage facilities as would obtain with light trucks, and yet retain all of the qualities of the car. Of course the best results are obtained with the trailers, if the owner desires to use his

The frames are wood of generous dimensions, and these are decked with longitudinal plank. The pole or draw bar of the trailer is of wood and is built into the frame at the forward end, and on the end is bolted the steel fitting that carries the socket into which the pivot on the end of the car frame bracket is placed. This fitting is so constructed that when the draw bar is raised above and lowered over the ball of the pivot a clasp or clamp is turned, and this secures the socket so that it cannot be thrown off the ball by any upward movement of the car or trailer.

#### The Body Equipment.

The platforms of the trailers are fitted with irons for the lower ends of the stakes or the stanchions that support the side and front end panels, and the rear ends of the side panels or frames are fitted with irons, so that the tail gates may hinge and drop, and when raised are secured by latches. The bodies of the model F trailers are 72 inches long and 51 inches wide, and those of the model S trailers are 100



Above: Trailer Coupled to Roadster; at Left, Trailer with Platform Stake Body; at Right, Semi-Trailer Used with Republic Truck—These Show the Two Sizes of Trailers and a Light Semi-Trailer

car practically without change, for the only fitting necessary is the installation of a bracket on the frame rear cross member. While this bracket is substantial in design, it is not unsightly and does not detract from the appearance of the vehicle. The bracket is bolted to the frame, so that it may be removed with comparatively little labor should the use of the trailer be discontinued.

#### Designed for Practical Service.

The Bettendorf trailers are simply and strongly built, and ought to endure for years with ordinary use. They consist primarily of a rectangular axle on which is fitted two artillery type wheels that are mounted on ball bearings in the small vehicle and standard roller bearings in the larger. These wheels are shod with either solid or pneumatic tires. The axles carry long, semi-elliptic springs that are pivoted to stout hangers forward and move in substantial guides at the rear, the hauling stresses being sustained by the forward ends, while the rear ends are free to move in the guides so that there is no restriction of the spring when it is deflected because of road shocks.

On these springs the body frames are mounted.

inches long and 48 inches wide. The side panel bodies are 10 inches deep with six-inch flareboards, and the frames of the platform bodies are 18 inches height.

The construction of these trailers is to a high standard. The wood is carefully selected and the irons are specially forged to dimensions that will endure. The springs are a high grade stock and these are underslung. The axles are regular truck types, that of the model F being  $1\frac{1}{4}$  inches square, and that of model S is  $1\frac{1}{2}$  by two inches.

The wheel bearings of the model F are American annular ball type, designed for truck service, and those of model S are either Bower or Timken roller. The wheels are second growth hickory and are to standard truck design. The tires of model F are regularly 30 by two-inch clincher solid band, and those of model S are 32 by two-inch solid band. The wheels will be fitted with pneumatic tires for additional prices. The standard color of the model F is red, with yellow wheels striped with black, and the model S is black, either colors being special.

#### The Semi-Trailer Body Types.

When designed for use as semi-trailers the con-



struction of the vehicles are slightly changed, the axle being further back so that some of the load is carried by the car or truck, and very generally these are fitted with larger wheels that are shod with steel tires. The springs are semi-elliptical, three-quarters platform suspension, with rear shackles. Because of the heavier loads that are carried, 1500 pounds being normal, the speed cannot be as fast as with the smaller types. The bodies are built without poles or draw heads, and there are no brackets bolted to the chassis frames.

The rear of the chassis frame is cleared and on this a frame is clamped to the two side members. This carries a transverse shaft or rod mounted in two lugs, which supports a metal ring with a centre section in which is a circular hole or bore. Securely bolted to the frame of the body is a second ring with a cross member that carries a short stub or pivot that passes through the hole in the centre plate of the lower half of what may be practically termed a turntable. The circles of the turntable contact the entire circumference, the transverse shaft on which the lower section is mounted obviating pressure stresses of any kind from vertical movement of the body, and the pivot allowing a right angle turn of the car or truck. The stub of this "rocking fifth wheel," so-called, may be keyed into the lower half of the turntable, but ordinarily the weight of the body or the load is sufficient to retain it in safety.

This method of coupling the semi-trailer requires jacks to lift the forward end of the body when loaded, if small size, and in any event if large size, and horses to support it while uncoupled, for this is safer than when merely jacked.

With the trailers a very light car may be used to draw a load up to 1200 pounds, and with the semi-trailers the carrying capacity of any vehicle may be doubled. When a truck is utilized the "rocking fifth wheel" may be quickly removed and another type of body installed when necessary.

#### **SMALLEST MARYLAND FEE IS \$5.**

Beginning July 1 automobiles in Maryland will be taxed 50 cents per horsepower. The minimum charge for any car will be \$5 a year. Commercial vehicles will be taxed at the rate of \$8 for a one-ton truck and \$6 additional for each added ton. Speed limits in all hamlets will be the same. The city of Baltimore will be privileged to collect a fee for parking cars in spaces specially set aside for that purpose in congested sections.

### **NEW VIM DELIVERY BODY.**

#### **Designed to Meet the Requirements of Government Mail Handling.**

The Vim Motor Truck Company, Philadelphia, Penn., has added to its standard types of bodies, which are built and furnished as required by the purchasers of its 1000-pound chassis, a new type that is known as model M. While this is designed especially for service in the different branches of the postal service, it is adapted for use in a very wide range of businesses.

The Vim company received an order from the United States Postal Department for a truck that was built to strict specifications for use in mail collection, distribution and transfer, and this body was so satisfactory that the company decided to standardize it and produce it regularly.



**A New Type of Screen Enclosed Body to United States Postal Specifications, Which Has Been Adopted as Standard with Vim Trucks.**

The body is an express type with screen sides and ends, with doors at both front and rear, so that the contents can be protected from theft. There is a rear step for the use of the driver or the carrier, so that the interior may be conveniently reached. The chassis is the standard Vim product throughout.

Director of Sales Wayne W. Light of the Vim company states that the demand for a dependable delivery unit from postoffices, mail contractors, rural delivery carriers and from the postal department has been so large that the production of this type is a necessity—so much so that a substantial part of the chassis built will be so equipped. Because the Vim chassis and the bodies are produced in so large quantities the price has been established at \$800.

The Rhode Island legislature has passed an act authorizing the city of Providence to borrow \$150,000 for the purpose of further motorizing its fire department.

## MOTOR TRUCKS WITH MEXICAN EXPEDITION.

### Troops Making Dash after Villa Have Been Well Supplied by Trains of Nearly 300 Machines, Operated Over Trackless Desert and in the Wilderness

**B**EFORE the expedition into Mexico to capture Villa was undertaken, the United States War Department had 61 trucks operating in different parts on the Mexican border. Since then the department has purchased eight additional trains of 27 transport

regulation army bodies there. Some of the later trains were equipped with similar bodies and tarpaulin tops at the factories.

A number of caterpillar drive tractors have also been purchased for the army and used to haul heavy tank trucks into the interior of Mexico. This truck equipment has been operated with great success. With it supplies of all kinds have been carried to the large body of troops which penetrated a long distance into Mexico—up to 300 miles—without use of railroads further than to Columbus, N. M.

#### First Trial of Army Transports.

This is the first time the general staff of the army has had opportunity to try out its plans for motor transport, and in view of the fact that the trucks have been operated so efficiently through deep sand over what is in reality a roadless desert, it is probably safe to say that motor transport will in

the main replace animal transport in the United States army as it has replaced all other types of vehicles in all the armies of Europe.

The trucks have been operated over desert trails that cannot properly be described as roads. After crossing the boundary for much of the distance the trucks frequently traverse wide beds of sand in which they sink to the hubs, and the full power of the engines is necessary to drive the machines



Supply Train of White Trucks at Columbus, N. M., Loaded and Ready for the Orders for Departure in Mexico.

trucks each and one repair truck for each train. These have been supplied by the White company, the Packard Motor Car Company and the Jeffery company.

In addition, 14 water and gasoline tank trucks have been purchased from the Four Wheel Drive Auto Company, Clintonville, Wis., and several White trucks, with tank bodies, which were built for the Standard Oil Company were released by that concern to the government and have



been put into the army service.

The transport trucks are all of 1½-ton size—a capacity the same as that of the ordinary army four-mule wagon and the first four trains which were shipped to El Paso as chassis were fitted with



At Upper Left: Making Up Train of White Trucks at Columbus, N. M.; Upper Right: Fitting White Trucks with Army Bodies at Columbus; Below: Trucks Loaded with Gasoline and Vehicle Supplies.

through. In spite of these conditions the trucks have been driven to average speed of 10 miles an hour very regularly, though the character of the surfaces crossed is indicated by a gasoline consumption average of eight miles a



Line of Packard Trucks in Train in March Through a Sage Bush Covered Desert, the Machines Being 100 Feet Apart While Moving.

gallon for light trucks that have never been loaded to their full capacity.

The Jeffery Quad trucks, which have been especially efficient on the soft cart paths and trails, are equipped with solid wheels which have the advantage over the usual artillery type, of lifting less sand and requiring less power to drive them.

#### Civilian Drivers for First Trains.

The first three truck trains to go to the border were accompanied by civilian drivers taken from the forces of the factories in which the machines were built. These men did not enlist in the army, but went on the pay roll as civilians at \$100 a month for the drivers and more than that for the bosses. Their term of service is three months.

The units later utilized are driven by enlisted men who were selected for their general suitability and carefully trained to meet every probable condition to be met while driving trucks. When the three months period of service for the civilians has expired, if the expedition has not been recalled, it is probable that regular army drivers will be available to take their places.

When the civilian truck drivers arrived at the border they were furnished with army uniforms and given automatic revolvers and cartridge belts. Machine guns are carried on one truck of each train and a guard of soldiers rides with them to repel attacks of any kind.

#### Gasoline Supply a Problem.

So much gasoline was required for the trucks to make the trip from the base at Columbus into Mexico to the advancing columns that it was necessary

either to send tank trucks to supply the trucks at points along the line of communication or fit the machines with large auxiliary fuel tanks. The several tank trucks were used to carry gasoline to the trucks along the route of the United States troops.

The hard service given both the trucks and touring cars by the expedition has been reflected by minor accidents and mishaps, some of which entailed repairs. The great majority of the passenger cars in use are Fords, which, because of their light weight, are better suited for driving

over the soft Mexican trails. General Pershing himself uses one. A single requisition for nearly \$10,000 worth of Ford parts was sent in by the quartermaster's department to make repairs and insure keeping these cars in operative condition.

The department established a machine shop at Columbus to keep all motor vehicles in repair and a rush order for machine tools and other equipment to the value of \$56,000 was quickly filled. The shop was soon in operation and is doing good work.

#### Trucks Carry Wireless Stations.

In addition to the transport trucks motor vehicles are used also for portable wireless plants and communication between the front and Columbus has been maintained with these equipments. These apparatuses were tried out about Washington for several years. Current for the wireless instruments is furnished by dynamos operated by the truck motors and aerials, which are made of poles in sections, somewhat resembling tent poles, are carried on the trucks for erection whenever communication is necessary. Bad weather is said to interfere with the transmission of messages at times, but the efficiency of the apparatus has been very satisfactory and very much superior to any other means of transmitting information that is available. It is probable that for communication to main headquarters, if the country were completely in control of the Americans, who would not need to consider the hostility of the de facto government or Villa's adherents, regular telegraph might be used. But the truck wireless stations have proved to be of great value in communication with detached columns.



Train of White Trucks Leaving Columbus for the Base of the Advancing Column of Troops Far Into Mexico; at Right, Trucks in Camp, with Wireless Station Erected for Service.



**President Henry B. Joy of the Packard Motor Car Company, Giving Cigarette Tobacco and Papers to Indian Scout at Columbus, N. M.**

The use of caterpillar tractors, a type that was ordered several weeks after the expedition got under way, is something new with the American army, though these have been of very great utility in Europe when the armies have to traverse soft ground.

The round trips between Columbus and the front have been so long that several days have been required to complete them. At night the men camp in the desert, with their trucks in a circle about them in the manner traditional with frontier men since the time of the prairie schooner caravans, which were arranged for defense against night attacks.

The days are very hot, with a relentless sun and almost always cloudless skies. There is no water available unless it is small pools, often long distances apart, which are frequently alkali and not always drinkable. Fuel is very scarce and consists entirely of dried vegetable matter, cactus or other types, nearly all well covered with thorns. The nights are very cold but the men are equipped with warm overcoats and blankets. The great contrast between day and night temperature, however, causes much discomfort.

#### **Army Officers Favor Light Trucks.**

It is the theory of American army officers that the bad roads the army is likely to have to operate over make the use of light trucks of 1½ and two tons capacity necessary. They have little faith in the five-ton and heavier types of trucks that have been successfully used in Europe.

If the heavier trucks can be used, as there is apparently no doubt they can be in certain localities in the United States at least, a great economy would result in the number of men required for transport service, and the length of road required for the transport trains.

But army officers have been holding competitive truck trials for years and there is probably no doubt that they are correct concerning the superior utility of the light truck, at least in the sand of the Mexican desert.

Indeed, the use of any truck would probably have not been undertaken under such conditions

two or three years ago. Success of trucks in supplying the troops is another example of their efficiency, similar to their use in the European war, which is sure to have large influence in promoting a wider use of trucks in commerce.

The service of trucks in Mexico has not been as dramatic, perhaps, as was the sudden call of the European nations for countless motor vehicles, but it is nearer home and has more national interest from that fact. Mexico itself is a large market for motor trucks in normal times and there is every likelihood that when affairs again run smoothly there a large number of trucks will be purchased and put in service, not only by foreign mining and business concessionaires, but by the Mexicans themselves. Practically all of these vehicles will come from the United States.

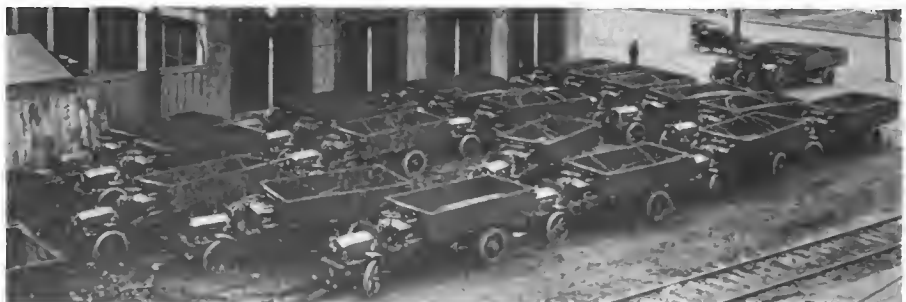
#### **Route Covered 360 Miles.**

At one time the line of communications into Mexico was 360 miles long and the trucks travelling at 10 miles an hour required 72 hours for the round trip. It would have been impossible to carry supplies that far with mules.

Army regulations fix 17 miles a day as the standard travel for a mule team. This would mean 42 days for the round trip. At this rate a mule team could not carry enough food for the mules to keep them alive for the trip let alone carrying freight. Each mule is fed three quarters of oats three times a day, which would require nearly two bushels a day for a four-mule team. The greatest load a mule team could haul under Mexican conditions would be 69 bushels of oats, and in the 42-day trip 71 bushels at least would be required. These figures do not take into consideration food and water for the driver. In many places water is not available and that, too, must be carried.

The men who drive the trucks have a strenuous life. They drive for long hours, sleep in the open, and are fed by enlisted cooks who accompany the trains. Frequently they have been fired on by snipers, but thus far without casualties. The trucks are drawn into hollow squares with the officers' cars in the centre and the men do picket duty in two-hour shifts during the nights.

The Vim Motor Truck Company of Philadelphia, Penn., announces that the sales agency for its trucks for Indianapolis and vicinity has been taken over by the Peterson-Keyes Auto Company of that city.



**One of the Trains of Packard Trucks Assembled at the Factory Before Shipment by Special Cars to Columbus, N. M.**

# \$350 and a Ford makes a guaranteed one-ton truck

## "World's Lowest Hauling Cost"

For three years—in practically every line of business—from California to the Atlantic—the Smith Form-a-Truck has demonstrated its unfailing performance, its wonderful durability, its comparative freedom from repair

expense, and its marvelous low cost of operation and upkeep.

The biggest corporations and the keenest and most exacting buyers are our best customers, because the Smith Form-a-Truck offers wonderful values.

## \$9,000,000 Sold to Date

This is the best answer to what a Smith Form-a-Truck has done and will do. Think of it—a guaranteed one-ton truck—built of the best procurable materials—a truck of proven dependability—at less than half the usual cost.

In the Smith Form-a-Truck, we have added to the unparalleled dependability, matchless economy and wonderful durability of the Ford, an almost everlasting attachment that carries 90% of the load. This attachment has 4-inch channel steel frame, real truck wheels, solid rear Firestone tires, double chain drive, 125-inch wheel-base, Timken bearings, special heavy steel axle and springs and accommodates standard 9-foot roomy body.

The attachment is all ready for use—telescopes on any Ford—new or old—fits perfectly, bolts securely and reinforces the entire frame. No skilled workmanship required—two men can do the job in a few hours.

12 to 15 miles of speed under full load—12 to 20 miles per gallon of gasoline—ridiculously low upkeep expense—and twice the work of four teams at half the cost.

## Immediate Deliveries

For one truck or a whole fleet. We have the material for and are building 50,000 of these trucks for 1916. We absolutely guarantee immediate delivery on the date promised.

Just cut out and mail the coupon below—TODAY.

## SMITH Form-a-Truck COMPANY

913 Adams Express Bldg., Chicago, Ill.



"Economical to run, speedy, powerful, and easy to handle."  
J. W. BUTLER PAPER CO., Chicago.



JERSEY FARM DAIRY CO.  
St. Louis.  
Unequalled for creamery and dairy uses.



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When a municipality buys, it buys right.



A Smith Form-a-Truck designed with special steel wheels to operate on car tracks.



MORRIS & CO.—PACKERS  
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Who know hauling costs down to the penny.

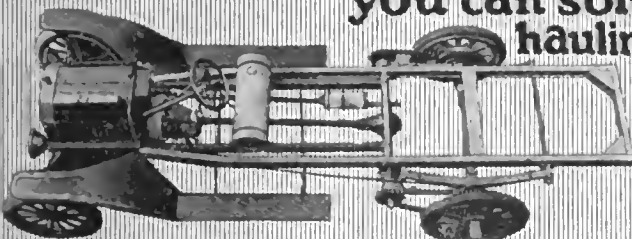


INDIAN REFINING CO.  
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Tank jobs that are unequalled for long and short hauls.



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Smith Form-a-Trucks meet the exacting requirements of the business.

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Smith Form-a-Truck Co.  
913 Adams Express Bldg., Chicago, Ill.  
Kindly send me your folder, "It Solves Your Delivery Problem," and put before me the facts and figures proving that Smith Form-a-Trucks give the cheapest delivery cost in the world.

Name .....

Street Address .....

City .....

State .....



# PRACTICAL MOTOR TRUCK MECHANICS.

## STRETCHING VALVE SPRINGS.

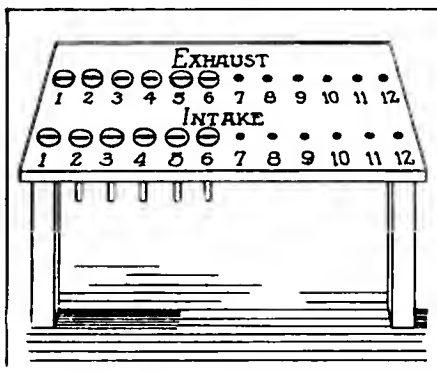
Frequently the clattering sound in the valve mechanism is due to one or more weak valve springs. This condition would also cause uneven motor operation, as there would be no positive action of the valves. Of course the proper remedy is to replace the weak springs with new ones but if these are not handy or the owner does not wish to meet the necessary expense, the only alternative is to renovate the old ones. This may be done by removing and stretching them, by securing one end in a vise and tying a cord to the other. Care should be taken not to stretch the springs to the extent that they lose their shape or to a point where they will close the valve with so much force as to do it injury. A stiff valve spring also causes extra consumption of power. Another method of increasing the strength is to insert washers under the lower end.

## RUBBER CEMENT.

A simple formula for making rubber cement is as follows: Thoroughly mix eight fluid ounces of carbon bisulphide and 40 grains of rosin. To this mixture add one ounce of old rubber which has been cut into fine strips. The rosin and carbon bisulphide can be purchased at any chemists, while the rubber can be cut from the tread of a discarded tire or old inner tube. The only objectionable feature of this cement is the disagreeable odor, due to the presence of the carbon bisulphide.

## VALVE RACK.

Because it is essential that valves be replaced in the seats from which they were removed during the overhaul of the engine, it is customary to place them on the work bench in the order of their removal. If they remain out of the motor for any length of time this system is not satisfactory because the order is

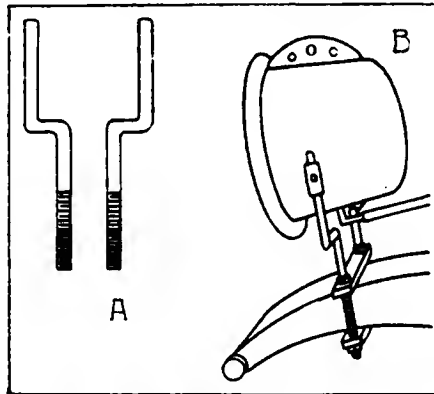


A Work Bench Valve Rack That Is Very Serviceable and Cheaply Made.

apt to be disarranged, the faces of valves scratched, or some of the parts lost.

A much better plan is shown herewith. It consists of an ordinary wooden

rack, which may be made a permanent fixture to the work bench or portable as desired. All that is required is the drilling of 24 holes, 12 in each row, to allow



Home-Made Lamp Bracket: A, Formation of Lamp Bracket; B, Showing Attachment to the Frame Horn so as to Cast All Light Downwards.

the insertion of the valve stems. One row is marked exhaust and the other intake. The openings in each row are marked from 1 to 12, each of these figures corresponding to the number of the cylinder from which each valve was taken. A rack of this type prevents complication, injury to faces and loss.

## HOME-MADE LAMP BRACKETS.

In an accompanying drawing is illustrated a lamp bracket which can be easily fitted to a truck without machine work, and can be adjusted to eliminate light glare.

The bracket consists of two suitable lengths of round cold roll stock threaded at the lower ends. By clamping in a vise the metal can be bent to form the step shown at A. From a bar of steel, one inch square, saw off two pieces that are two inches greater in length than the width of the car frame. Clearance holes should be drilled near the ends of these so that the threaded ends of the bracket pieces can be inserted. A few nuts and washers complete the equipment.

The method of mounting on the car is shown at B. Two nuts are first threaded onto the bracket pieces, which are then passed through the holes in the short bars. By fitting washers and nuts on the threads at the base of the bracket pieces the bracket can be adjusted at any desired angle on the frame.

It is obvious that this arrangement will allow the headlight to be tilted so that the light rays will be cast downward. Of course brackets should be made for both headlights.

## STARTING FROZEN CAPS.

When preparing to grind in the valves, one often encounters difficulty in starting the caps. This condition is especially true if shellac has been used on the

threads to insure a tight joint. When additional leverage on the wrench fails to start them, start the motor and allow the engine to warm. The heat will cause the metal to expand. Then pour a little cold water in the recess of the cap. This will cause the cap to contract sufficiently so that it can be easily moved. When replacing the cap coat the threads with graphite.

## SLIPPING FAN BELT.

When the fan is driven by a belt, the operator should occasionally inspect the latter and if necessary adjust it to avoid slipping. The radiation of a motor is calculated on the basis of a certain volume of air passing over the radiating surfaces. If this supply of air is decreased, because of the failure of the fan to revolve, overheating is apt to be the result.

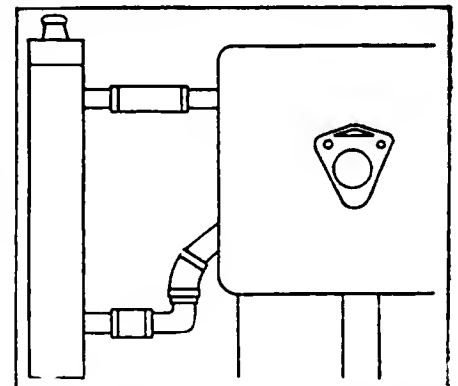
## FREE WATER CONNECTION.

Frequently the rubber hose used to connect the lower opening of the radiator to the opening in the cylinder will become kinked and the free circulation of the water will be impeded. Many methods for remedying this condition have from time to time been explained in these columns. In the accompanying sketch is shown a method suggested by a subscriber.

A short rubber hose is fastened to the lower pipe of the radiator and a second short length to the water intake pipe of the cylinder jacket. The two are then joined by a small iron elbow, such as is ordinarily used for making piping connections.

## PATCHING OIL WICKS.

The pleasure of night driving is often nullified through one of the oil lamps failing to burn properly. In the case that the wick is too short to reach into the oil the trouble can be overcome by attaching a small piece of waste to the



Pipe Elbow in Radiator Outlet Connection Will Prevent the Rubber Hose Kinking and Insure Free Circulation.

one in the lamp by binding the two together with a rubber band. The oil will pass readily through the waste and thence to the wick.

# The MOTOR TRUCK

*Devoted to Motor Driven Business  
Vehicles of all Classes*

Pawtucket, R.I.

Vol. VII. No. 5.

MAY, 1916.



COMPETITION is a factor that has strange influence, and when operations are with adequate and efficient facilities and transportation equipment is practically the same, distance then establishes limitations that are as absolutely defined as though haulage were eliminated entirely and price based on production alone.

This may appear a strange statement because of the prevailing assumption that with capacity loads, and speed much greater than with horse vehicles, the power truck in long hauls is most economical and most productive. The aspect is entirely different than that generally conceived by business men, for it implies that the selling cost must be established on the distance hauled.

This result does apply in some instances, and to a degree that is little realized, but it is found when the values of the loads are very small, so that the cost of haulage must neces-

sarily be reflected in the price, and there are limitations to what can be obtained.

A striking example, however, is illustrated in the case of the Rowe Contracting Company, Boston, Mass., which operates stone quarries at Washington Heights, at Brighton, at Malden and at Worcester, deals extensively in crushed stone and engages in construction of magnitude, such as highways and streets, sea walls, retaining walls and occasionally other work.

By this is meant that with all other conditions equal, with the best method of transportation available and operated with a very carefully devised organization, beyond a radius that has been very accurately defined by experience, business cannot be done at a profit and meet the prices of competitors who have shorter hauls. And failure to meet these prices means that contracts are placed elsewhere.



Weighing the Loads of Crushed Stone at the Office in the Quarry of the Rowe Contracting Company, Boston, Mass.

While one may assume that this is a barrier in one sense to expansion, it is also a bar to competition that would have a tendency to reduce prices, and in the final analysis establishes a definite area or territory in which operations may be profitable.

The radius of operating is then of decided interest, and when this is fixed at approximately five miles from the quarries one might regard the limitations such as would restrict the business, but this is far from being the fact. The result is what has been experienced by others in differing enterprises, but not so clearly and well established.

#### **Intensified Operating Means Efficiency.**

One may ask why this particular and peculiar condition has been emphasized, and the answer is that it is to demonstrate the need of high operating efficiency and very careful economy to obtain the most business that can profitably be obtained in the area to which the activities of the concern are limited.

quarries that are operated by different concerns that have practically the same operating facilities as the Rowe company. Quarrying the stone and crushing it may be said to cost approximately the same or at least the difference is so slight that it need not be considered, and so the company that has the least haulage can make the greatest profit if a stated market price is to be established.

Thus one may assume that each company quarrying and dealing in crushed stone absolutely controls the market within a certain radius of its quarry and crusher, and that beyond this the patronage is more or less dependent upon the prices that can be made. Naturally the concerns closest together are in keener competition than those further apart, and this competition is accentuated by the very general custom of those using broken stone obtaining prices for stated quantities delivered at the work.

Crushed stone is used more and more each year for



Seven of the Eight Trucks Used by the Rowe Contracting Company and the Packard Car Used by Mr. Rowe for Supervision and His Personal Service.

Because of the limitations the quarry at Malden was leased and developed to meet the demands of customers who could not be profitably dealt with from the original and main plant at Washington Heights, but the Worcester quarry was secured and operated because there was an opportunity in that city for the business, which the company regarded as not having the same territorial restrictions as obtain in Boston.

With reference to the Boston quarry a more definite explanation of the conditions may be desirable. The property on which it is located is in Brighton, on the top of a hill that is the highest part of the city. It is  $4\frac{1}{2}$  miles from the State House (which is the recognized centre from which distances are stated in that city), and five miles from the foot of State street, at Atlantic avenue, which is the water front.

#### **Market Price Plus Haulage Cost.**

In the Roxbury and Dorchester sections of the city, which are nearer than Brighton, and at distances from two to five miles from the State House, are other

varying construction purposes. It is necessary in concrete, from which building foundations, basements, walls, floors and sometimes practically entire structures are built; for bridges, abutments, piers, retaining walls, culverts, drains, walks, drives, paths, roads and streets, copings, curbs, steps, and for a great diversity of uses. When economy is a factor, and it usually is, concrete is usually specified for buildings. The uses made of cut and dressed stone are comparatively few. The stone is generally cut and dressed at the quarries because of the facilities for the work and reduction of the transportation weight to minimum, this lessening the initial cost and obviating the possibility of damage from handling.

Concrete as it is ordinarily used is composed of cement, sand and either broken stone or gravel, the proportions being from 50 to 62 per cent. of stone, according to the work, though in some instances, for very fine construction, gravel replaces the stone. The cement and sand are obtained from other sources and



Truck Being Loaded by Gravity Under One of the Bins of the Crusher and Elevator at the Quarry.

the mixing is usually done at the work. The cement is placed in forms and quickly solidifies.

From the viewpoint of the builder the concrete is cheaper than cut stone or any other equally substantial material, it is very enduring, it is more economical to use because operations can be expedited and excellent appearance can be obtained, especially when combinations of other materials are used. For these reasons the use of concrete is increasing each year and the demand for stone is proportionate.

#### Use of Material Is Seasonable.

Building operations are most active during the period of the year when the temperature is above freezing, although cold weather does not necessarily cause entire cessation of construction, but other constructing is carried on for from eight to nine months of the year. In the early spring work of every description is begun, and with rare exceptions the desire is to complete these undertakings as rapidly as possible. This means that the demands for material are practically the same—that deliveries must be made of sufficient quantities so that there shall be no interruptions.

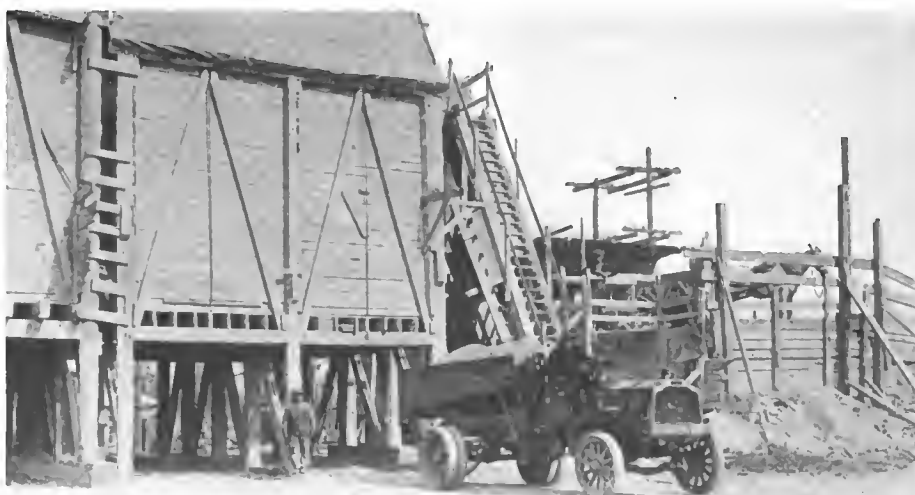
As the use of concrete is becoming more general each year and the building operations consistently increase, the problem of the firms producing crushed stone is to meet these requirements so that they shall not suffer through competition. The building is to some extent influenced by the weather, for rain means cessation unless the work is under cover, and there are times when contract stipulations or conditions impel the contractors to exact preference

being made that will require all the resources of the company to deal with.

The main quarry of the Rowe company at Washington Heights is at Lake and Washington streets, and there operations are practically reducing a large ledge to what is a building grade. The property abuts Lake street, which is a fine boulevard, and in which considerable building is now progressing. Eventually the quarry will be the site of residences and apartments, and the quarrying has been done with the view of eventually disposing of it for a building site. For this reason practically all of the work is cutting away the ledge to a grade, for further excavation would necessitate filling later on and would probably lessen the value of the property.

#### Quarrying to a Building Grade.

How much rock has been removed is unknown, but it will possibly aggregate several million tons. While a considerable part of the ledge has been cut



Loaded Truck in Front of the Crusher—Loading by Gravity Usually Requires Two Minutes' Time.

away, there is still sufficient rock in sight to assume a continuance of the work for a number of years with at least the same production. The stone is blasted out and drawn to a combined crusher and elevator that has a capacity of about 700 tons a day, and as the stone is crushed it is screened to five standard sizes—dust, pea, one, 1½ and two-inch, while other sizes may be produced to meet special requirements.

The production of the crusher is to capacity as a rule for about nine months of the year, and this may be regarded as about 160,000 tons, in about 230 working days. There is not necessarily loss of time of the crusher, although the quarrymen do not work when rain is falling. The crusher may be operated more or less during the remainder of the year, but not to capacity. The stone as it is crushed and screened is delivered to the pockets or bins of the crusher, which, as the entire structure is elevated sufficiently above

nothing of the interruption of the work. As the stone is brought to the crusher it is carried upward by conveyors which supply it as rapidly as it can be worked. Smaller and portable crushers would not be as profitable to operate, for obviously the cost decreases as the production increases.

#### Capacity of the Crusher Bins Limited.

The capacity of the crusher bins are limited for several reasons, one of which is that in freezing weather the dust and the pea size bins must be emptied each night. Were this not done the wet rock would freeze and the material would not discharge until broken with bars, which would entail costly delay each morning. By discharging what is remaining in each of these bins nightly the work can go on without interruption.

During winter weather the crusher is operated and the crushed stone is carried outside of the bins and heaped on the ground. In this manner considerable material can be accumulated that is available for delivery when the demands are in excess of the capacity of the crusher, in the early spring, for instance. But obviously this cannot be handled as it is when stored in the bins. Each cart or truck must be loaded and until this year loading from the piles in the yard was done by hand, laborers shoveling the stone into the vehicles.

#### Cost of Handling Material.

While in one sense this accumulation was an economy, the cost of shoveling, which averaged about 12 cents a ton, must be added to the production cost, and with thousands of tons to be handled this expense aggregated a considerable sum. To economize the



The Crusher and Elevator, Which Has a Capacity of About 700 Tons Daily When Worked Normally.

the ground so that trucks and carts may be driven under them, are designed for gravity loading.

#### Loading from Bins by Gravity.

Loading is usually done by driving under the crusher beneath the chutes from the pockets, and by raising gates the drivers can load their carts or trucks in approximately two minutes. As there is a chute from each bin, a series of loadings can take place simultaneously, and there is seldom, if ever, necessity for the drivers waiting for each other. The surface of the property is reasonably even and the roads and cart paths through it are very good, so that there is no reason for loss of time because of vehicle obstructions.

To obtain ideal production the crusher might be located nearer the quarrying, as it was when first constructed, but as the rock was removed the work followed the ledge until transporting the rock from where it is blasted to the crusher is a necessity, for the crusher is too large a structure to move and the cost of removal would be a considerable sum, to say

loading a portable loading machine was purchased. This is mounted on wheels and can be located wherever desired. It is operated by an electric motor and the current is supplied from a convenient electric main. The loader is a size that can handle two tons a minute, and the trucks and carts are loaded with this at a cost of two cents a ton for labor and current, and the time of the men and the vehicles is gained, for the driver and one man can operate the loader and supply it with the material. Whenever required the loader can be quickly moved to work at any pile of stone.

The stone as it is produced at the crusher is seldom hauled by the purchasers. The price is based on the ton delivered, and obviously those who buy at the crusher and do their own hauling pay as high prices, if not higher, than would be charged for delivery when their own haulage expense is added. The reason for the probably greater cost is that there are very few concerns that have so efficient vehicular equip-



ment. The company does not operate its trucks and carts for profit from them, and the buyers of stone benefit from the fact that in the prices paid only the exact cost of the hauling is figured.

#### Careful Attention to Accounting.

Ransom Rowe is the head of the company and he has had long experience operating it. Competitive possibilities have been carefully determined by analysis and accounting. The expense of operations has been minimized wherever practical. The company was the first in Boston to use motor trucks in the haulage of stone and the purpose was to determine the distance from the quarry that deliveries could be made and meet the prices of competitors. Originally all haulage was done with horse carts. The first truck was purchased five years ago and this was worked with horses. The intention was if the machine was more productive than the carts to purchase whatever equipment could be worked practically and to dispend with horses so far as this was possible.

The location of the Washington Heights quarry is especially advantageous for economical delivery, for being on the highest land in Boston all of the loads taken from it into Boston are drawn down grades a part of the way, and with rare exceptions the streets and highways are fairly level. Not only this, but the surfaces are reasonably smooth, so that the loads drawn by horses will average larger than were there frequent grades to be ascended and the thoroughfares were rough.

Prices for the stone are made first on the expense of production at the quarry, to which is added the cost of hauling the distance between the quarry and the place of delivery. By this is meant that this is the manner of reaching quotations made to customers, and this affords practically a uniform margin. The company when it bought its first truck, an Atterbury, hoped to extend its zone of operations considerably beyond what could be profitably served with horses, for the greater capacity of the machines and the faster speed were believed to be the main factors necessary for expansion. To determine to a certainty the radius in which trucks could be economically worked was absolutely necessary. The cost with horses was known in a general way before trucks were considered, but had not been reduced to precise figures.

Here the interpolation is necessary that within the past two years prices have increased abnormally, and this is reflected in crushed stone production quite as much as in any other industry. For instance, greater prices are paid for labor, for fuel, for explosives, for tools, for horses, for horse food, for motor fuel, for

tires, and, in fact, for practically every item that enters into the expense of production and maintenance. For this reason costs that were accurate two years ago are not valuable unless with them is shown the ratio of increase of price with reference to every form of expense. Neither have the increases been uniform. This statement will explain as well why extreme care is necessary to obtain the largest economies and the greatest efficiency, because competition must be met.

#### Gain in Horses and Trucks.

The first truck was delivered to the Rowe company about June, 1911, and in August, 1913, or 26 months later, the company was operating six machines. The Atterbury truck was sold and the equipment in 1913 consisted of two five-ton Alco trucks, three three-ton Packards and one four-ton Peerless. At that time the company was using about 80 horses and 40 carts and wagons. Between the time the first truck was purchased and the time it began to utilize



Packard Truck Leaving the Garage at the Quarry for the Work of the Day—The Average Mileage is 55 Daily.

six trucks the company had tripled the number of horses in service, which was due, however, to the development of its business.

The period between June, 1911, and June, 1913, was devoted to truck experiment. That is, the company sought to determine what would be the most economic use of both horse and truck equipment. At that time the cost of delivery with horses was found to be approximately 13 cents a ton a mile, which was extremely low. This meant that the delivery of a load of four tons three miles would cost with its own equipment \$1.56. Crushed stone was valued at about \$1 the ton. Adding to this the cost of haulage, the increase of price because of transportation alone, without profit for the use of the vehicles, was approximately as follows:

Quar.	1 M.	2 M.	3 M.	4 M.	5 M.	6 M.	7 M.	7½ M.
\$1.00	\$1.13	\$1.26	\$1.39	\$1.52	\$1.65	\$1.78	\$1.91	\$1.97½

This shows that in a radius of 7½ miles the cost of the stone was practically doubled, and obviously

The trucks and horse carts were equipped with hand hoists so that the loads could be quickly discharged, and as they were generally loaded by gravity the principal saving in the trucks as compared with animal carts was in the larger capacity and greater speed. In comparisons of the trucks and the carts the company determined then that a three-ton truck was equal to two two-horse carts, the four and five-ton trucks to four two-horse carts. The trucks were kept moving so that average mileage was about 55 daily.

### No Trucks at the Malden Quarry.

There is no doubt that the experience at the Washington Heights quarry in a general way would obtain at Malden, but because of the belief that the service lives of the trucks would be very much reduced were

they driven on the roads at speeds that would show profit horses have always been used there. Until the highways are considerably improved the animals will be used. What may be applied to this concern in Malden applies to all other stone producing plants in that city. For this reason the character of haulage equipment is not a factor, but

Truck No.....					Date.....	191....	
<h2 style="margin: 0;">ROWE CONTRACTING CO.</h2> <h3 style="margin: 0;">CHAUFFEUR'S REPORT</h3>							
Chauffeur.....							
DELIVERED TO	TIME		Odometer	Weight	COST		
	Arrived	Left	Readings				
							Depreciation
							Repairs
							Driver
							Gasoline
							Cylinder Oil
							Miscellaneous
							Total
Loss of service, Hours      Minutes Cause							Miles per Gal. of Gasoline
							Cost per Mile
							Tons Hauled
							Cost per Ton per Mile
<div style="display: flex; justify-content: space-between; padding: 5px;"> <span>Report is not complete until Chauffeur notes lost time and cause</span> <span>Gasoline</span> <span>Gals.</span> <span>Oil</span> <span>Pts.</span> </div>							

**Blank on Which the Drivers Make Daily Report of Both Time and Work Done and on Which the Daily Operating Expense is Computed.**

At that time the experience had justified the conclusion that the horse carts were more economical than trucks from the quarry to a radius of three miles, and that between the three and the six-mile radius the trucks were the most profitable. Referring to the illustration of mileage cost given above one will note

From statements made one may accept that the active season for quarry work and stone crushing is approximately nine months of the year. Aside from affording continuous employment to its help there is practically no profit from operations in winter. The labor is not so productive and production costs more, while the expense of distribution is considerably increased. While haulage by animals is much reduced owing to the lighter loads that are necessarily carried, more power is required, which necessitates greater fuel and oil consumption, to drive the trucks. The machines, however, have the advantage of being practically tireless. They can be worked in conditions in which horses would be almost useless.

### Result of Three Years' Experience.

The experience in 1911, 1912 and 1913 was over the active periods of nearly three years, and this may be considered a sufficient length of time to reach well

founded conclusions of truck possibilities, but there was also the character of competition to be considered, and this was only obtained by careful comparison of the local purchasing. A considerable part of the stone is taken by the city of Boston, another part is taken by contractors, and there is that part required by the works in which the company as a contractor is engaged.

Since that time the accounting has proven another very significant fact, and that is that the radius in which the company can profitably operate is five miles from the quarry. This being so a necessity was to increase the efficiency of the trucks so that they could be more profitable within that zone. This has been done so that where the carts and horses could be worked more advantageously within a radius of three miles, the zone where the animals show equal or greater profit is within a radius of one mile.

#### **Truck Efficiency Much Increased.**

In other words, the cost of stone distribution by horses has so increased, despite the fact that expense has been carefully analyzed, economies made wherever possible and efficiency maintained if not improved, and the cost of truck operation has decreased through greater experience in operating and maintaining them, that the machines are the most economical.

There is a great deal of significance in the efficiency gain of the trucks as compared with horses. The purpose was to establish which form of haulage would be the most economical. There were no reasons to favor animals or trucks, and there was every reason why the highest efficiency and the greatest economy should be obtained. The value of experience is very practically demonstrated in this instance. As the operation and maintenance of the machines were better understood the efficiency increased. Though the expense of horses is now greater than ever, the price of fuel and tires, and generally the cost of all supplies and labor necessary for the trucks, has correspondingly advanced. Taken item by item one will find that the greater efficiency of the trucks is because they are better used and more carefully operated. The machines are not overloaded, for this means eventually mechanical deterioration and greater tire cost. They are given thorough care and adjustments and repairs are made without loss of time when necessary.

#### **Eight Trucks Now in Service.**

The company now has in service a five-ton Alco, three four-ton Packards and one four-ton Peerless, two three-ton Packards and one two-ton Autocar trucks. One will realize that the company has favored the four-ton size rather than the five-ton or the three-ton, and the statement is made that the four-ton truck has been found nearly if not quite equal to the five-ton because it has greater speed, although its capacity is less, and the three-ton is not equal to the four-ton because the load is relatively so much smaller, though these machines are faster. From the experience with trucks the four-ton size is that which is best suited to the

work, although there are instances where this will not apply.

For deliveries of small loads in a comparatively short radius the Autocar is used. This machine has greater speed than the others and hauls of approximately two tons can be quickly made. For this class of work the Autocar has been found very serviceable. All of the machines are equipped with Monahan hand hoists. Power hoists are not favored because they cost more and the time gained with them is not sufficient to justify the additional investment and the increased cost of operation, for power necessitates consumption of gasoline and oil.

#### **Trucks Average 55 Miles Daily.**

The machines in use will average approximately 55 miles a day, and a half of the distance they are driven loaded. Daily mileage in excess of this is the exception and not the rule. The trucks are kept in a garage at the quarry and they are cared for by a mechanic who is employed with the understanding that he is to keep them operative. When occasion requires he works nights or Sundays, and he has the assistance of the drivers when he requires help with his work. The trucks are to be ready for service mornings unless there is an excellent reason why the work cannot be completed. The garage is equipped with several small machine tools and all hand tools that are necessary for the mechanic to do practically any work that may be required. The mechanic also does the overhauling save when the work is such that it cannot be done outside of a service station, in which event the resources of the manufacturers are available.

The Alco truck, which is very near its fifth full year of service, has been found to be surprisingly efficient, and this is attributed to the driver. He does his work with marked economy of gasoline and oil and the tire mileage he obtains is far in excess of what is obtained with the other trucks. And, strangely enough, whenever another driver is working the truck, as was necessary in the summer of 1915, when the regular man was recovering from an operation for appendicitis, all kinds of things happened. The main bearings were burned and a transmission gearset was damaged because a wrench had been left in the case—accidents which cannot be regarded as resulting from design or construction.

#### **The Work of the Drivers.**

The drivers work about 8½ hours daily, and they are given a half hour each morning before starting to grease and oil the trucks. They leave the garage at 7:30 and work on whatever jobs may be assigned to them, the deliveries being made according to the demands for materials and the trucks are chosen with reference to the haulage immediately required. Usually the largest trucks have the longest hauls within the operating zone. The operating plan is to keep the trucks moving with the least idle time possible.

As all loads are weighed at the office at the quarry when the trucks are leaving and the time of arrival

and departure of the trucks is kept, this accurately checks every trip. The drivers must receive the weigher's slips and must necessarily report at the office to obtain them. These slips are delivered to the customers. The accompanying report of the driver is intended to cover a day's work. This is filled each trip and shows to whom delivery was made, the time of arrival and departure from the place of delivery, the odometer reading, the weight of the load, and in the event of delay the time delayed and the cause must be specified.

#### **How the Results Are Obtained.**

The report also includes the gasoline and oil supplied the truck in gallons and pints. With this report and the record of the weigher and of the arrivals and departures from the quarry the work of the machine for the day is completely detailed.

On this blank is noted the items of expense for depreciation, repairs, wages, gasoline, cylinder oil and miscellaneous. There is a charge for overhead that includes the insurance, taxes, interest, storage, light, heat, water, clerical service, etc., and this is also added to the items enumerated above. Note is also made of the miles to the gallon of gasoline, the cost a mile driven, the tons hauled and the cost of hauling a ton a mile. Thus each day's record is complete. These records are transcribed into books, there being one for each truck, and the entries can be footed to give totals for any given period. With the record for the day or for any period accurate comparisons can be made of the expense and economies can be devised on the basis of the deductions.

#### **Not Worked in Bad Haulage Conditions.**

In the winter when the street conditions are not favorable for haulage the trucks are not worked, the policy of the company being that there is greater economy in keeping them in the garage than using them when the fuel and oil consumption would necessarily be high. The principal reason is that while they could be driven without chains practically all of the time if loaded, driving them when light is not good judgment and chains are destructive of tires as well. When not in use the only items of expense are insurance, interest and taxes, and the garage cost prorated. Other work is found for the drivers when the weather is such that the machines are not used. Of course when the trucks are not in service building operations are not practicable as a rule.

So far as the trucks are concerned they are becoming more and more economical in this work from the provision made for their use by contractors. Where they were not at one time considered and the drivers had to make the best of the conditions they met with, where buildings are now being erected dumping platforms are built on which the trucks may be driven and quickly dumped, and if they are driven into excavations in many instances the gear is rigged so that they may be hoisted out with steam windlasses or with tackle by their own power, so that the time of the machines and the drivers is economized. Very

frequently the stone is dumped into chutes and carried into excavations, or it is delivered where it can be handled advantageously, but in almost every instance the use of the truck is provided for. And because they can often be used where animals could not be worked save with much loss of time, they are favored by contractors as against horse teams.

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#### **CATERPILLAR TRACTOR FROM MAINE.**

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Representatives of the warring governments of Europe are very much interested in the Lombard Tractor, made in Waterville, Me. This machine was first designed in 1909 with steam as motive power, but it is now built with six-cylinder gasoline engines having bore and stroke of six inches. There are two wheels in front with steel tires for country or rubber tires for city use, which may be replaced if desired by runners for operation in the snow. On high speed the tractor will make six miles an hour and will haul about 40 tons on wagons trailed behind, in addition to carrying five tons. The rear drivers are of the track laying or caterpillar type and can be operated over any kind of ground. The machine is distributed by the Lombard Tractor-Truck Company of New York and has been sold to lumbermen, farmers and others who have much hauling on soft ground. At a recent demonstration for war buyers a tractor hauled 31 tons six miles an hour on a train of wagons through very deep snow.

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#### **THE ECONOMY OF GOOD ROADS.**

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A Federal truck with a hub recorder attached was driven 238 miles from and to Detroit, over all kinds of roads, to determine the speed at which the truck could be practically used on the different surfaces and so establish a basis for estimating the cost in lost time to the truck owner of bad roads. On the concrete road in Wayne county the truck made 16.41 miles an hour, on gravel roads 9.51 miles an hour and on ordinary dirt roads 4.64 miles an hour. The enormous gain in time and the saving of money by good roads is thus illustrated. On the good roads the truck did four times as much work in the same time as on the dirt road. The savings in money are almost if not quite in proportion to the time saving, as the mileage per gallon of gasoline on poor roads and the wear on tires were of course much greater.

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#### **SPLITDORF EQUIPMENT ON WAR TRUCKS.**

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The Jeffery trucks now used in Mexico to haul supplies for the United States army are equipped with Splitdorf magnetos. Of the first 23 trucks that went to Casas Grandes, on only one was trouble experienced, and this was because of a sticking breaker bar. A supply of spare magneto parts was taken with the trucks. After the first shipment 108 additional Jeffery trucks were ordered for the same service.

### MOTOR TRUCKS IN GREECE.

The development of Greece as a market for motor trucks is believed to be an impracticability during the war in Europe because of the prohibitive prices for ocean transportation. At present the cost is almost equal to that of the retail price of a good, but low priced American pleasure car.

The scarcity of motor cars in that country is indicated by the report that in Patras, the business capital of its district and a city with 40,000 population, there are only six motor vehicles in use, two of which are second-hand trucks, which are used for freight purposes around the city's docks.

Before the outbreak of war a few concerns were interested in representing American makers of pleasure cars, but the present high ocean freight rates have for the time being discouraged any ambitions of the agents or of the people to purchase machines.

### VIM PUSHED IN AMERICAN MARKET.

As a result of concentration on the American market since the European war began, instead of devoting itself to foreign trade, the Vim Motor Truck Company, Philadelphia, Penn., has representation in 468 cities and has placed its trucks in many lines of business. It is very firmly established and will have a large and secure business when foreign orders cease.

### ELECTRIC CHARGING STATIONS.

A new electric automobile charging station booklet has just been published by the New York Electric Vehicle Association, Irving place and 15th street, New York City. It contains a complete list of the charging stations in New York City and within 100 miles of the New York city hall. It lists the stations in such a way that the maximum amperage and voltage available at each station is known. There are also two route maps. One of these is for New York City and the other is for suburban runs on which charging stations are shown. There is an interesting chapter on auxiliary charging or "boosting," with a table of constant current boosting rates.

The book shows the constantly decreasing price of electricity for battery charging. Year by year the rate has been going down until the present maximum rate of the New York Edison Company is five cents a kilowatt-hour, which tapers down to one cent a kilowatt-hour for the large users of current.

### UNIT STEAM RAILROAD CARS.

#### Stanley Engine Adapted for Equipment Expected to Cheapen Operating Cost.

The Stanley Motor Carriage Company, Newton, Mass., which has for many years built steam automobiles, is adapting its steam engines to single-unit cars for operation on steam railroad tracks and on electric trolley lines. One man can drive such cars, which seat 44 people and cost about five cents a mile to operate. They can be driven up to 60 miles an hour. The power plant is practically the same, but a larger size than that now used in Stanley cars. The cars will be marketed by the Unit Railway Car Company of Massachusetts.

The power plants will be made by the Stanley company and the bodies, which will be lighter and cheaper than those of the ordinary car, will be turned out by the Laconia Car Company of Laconia, N. H. The fuel used will be kerosene. The cars will be equipped with electric lighting systems. The cars will be made in two sizes. One will carry 44 passengers and will cost about \$10,000, while the other will seat 26 and will cost about \$5000. The first cars will be completed in about a month.

The railroads everywhere have been losing money on their suburban trains because of the high cost of operation and the competition of trolleys and bus lines. Claim is made that with this type of car the railroads can hold their business and greatly improve their service to the public. The manager of a middle western railroad, who examined the cars, told the builders he believed there would be a market for 1000 the first year.



G-V Gas-Electric Tractor, 10 Tons Capacity, in the Service of the New York City Street Cleaning Department. Digitized by Google



## DEVELOPMENT FROM RACING.

### Rapid Progress of Motor Vehicle Industry Results from Track Contests.

At the first meeting of the Mid-West Section of the Society of Automobile Engineers, held at Chicago in April, Charles John, president of the Wisconsin Motor Manufacturing Company of Milwaukee, Wis., which built the motors for the victorious Stutz racing cars, declared he thought much of the rapid progress of the American motor vehicle industry on the engineering side was due to racing. What would require a year's testing under ordinary conditions can be concentrated into a few hours, he said.

The fundamental principle in building a high speed motor, said Mr. John, was to reduce the weights of the reciprocating parts to the smallest that are consistent with safety.



Charles John, President, Wisconsin Motor Manufacturing Company, Milwaukee, Wis.

This reduces inertia forces and vibration and saves much power that would be lost in extra friction. Special materials and alloy steels of various sorts make this reduction in weight possible.

Much of the success with the Wisconsin motor in racing he attributed to the system of forced feed lubrication which is used, which is extremely efficient

and economical. In a 10-hour test at the factory recently an engine consumed 1/100 pint of oil per horsepower per hour.

The amount of power available in an engine, he said, was dependent on the volume of gas consumed in the cylinders, so that a small cylinder engine going faster would develop as much power as a larger engine running slower. Extensive trials also showed that a long stroke motor could be made to run faster than a short stroke.

One of the first stock motors made by the company was shipped to Harry Stutz of Indianapolis, who was then an unknown engineer and designer. After testing it Mr. Stutz decided to enter the car in which it was used in the Indianapolis race. Entering a 389 cubic inch stock motor in that contest at that time seemed extreme confidence to Mr. John, but it so

aroused his interest that he journeyed to Indianapolis to see the race.

Up to 1915 all of the Stutz cars used substantially the stock T head Wisconsin motor. After the Indianapolis race of 1914 the company agreed to build four special racing motors for Stutz that would be the equal of any of the foreign makers. The Wisconsin chief engineer, A. F. Milbraith, sketched out an idea that met Stutz's approval and work was started on the engines.

Steel for crankshafts and connecting rods was ordered at once from Belgium, but war was suddenly declared and it became necessary to look elsewhere for material. The most careful scientific tests were made of the steel provided by American producers, and it was shown that this steel is as good as any that can be had anywhere.

When the first motor was completed and put on the stands no extraordinary power was developed and a close study of ignition and lubrication was necessary before results were secured. The 295.81 cubic engines developed 131 horsepower at 2900 revolutions per minute. The engine was shipped to Stutz, who tried it, approved it, and ordered work rushed on the other engines. Mr. John then gave in detail an engineering description of some of the features of the motor.

### BLACKLEY ASSISTS BOULDEN.

Bryce E. Blackley, formerly New England division sales manager for the Chase Motor Truck Company of Syracuse, N. Y., is now assistant to General Sales Manager H. T. Boulden of that company. He spent several years in direct contact with dealers and understands thoroughly the problems to be met in carrying on the research and dealers' aid work of the department. He succeeds W. A. Clare, who resigned April 1 to become general sales manager of the Atterbury Motor Car Company of Buffalo, N. Y.

### STERLING CHICAGO BRANCH MOVED.

The Sterling Motor Truck Company of Chicago, a factory branch of the Sterling Motor Truck Company of Milwaukee, Wis., has been moved from 2637 Cottage Grove avenue to 1324 South Michigan avenue. The new location is at one end of Chicago's automobile row and is convenient to the various hotels. The display floor has sufficient room to show at once all models of Sterling trucks, while a well equipped service station at the rear is open days and nights and Sundays.

### MOTORKART REPORT IS FILED.

The trustee in bankruptcy for the Motorkart Company has filed his final report in the office of the referee, MacGrane Cox, 1305 Woolworth building, New York City.

## TWO NEW SIZES OF CHASE WORM-DRIVEN TRUCKS.

**F**IVE different sizes of machines make up the series of vehicles built by the Chase Motor Truck Company, Syracuse, N. Y., two of which, model A, load capacity 2000 pounds, and model B, load capacity 5000 pounds, are new constructions, these supplementing the models T, R and O, which are 1500, 4000 and 7000 pounds load capacity respectively.

With these vehicles statement is made that the company can now meet a demand for more than 85 per cent. of all haulage requirement. The machines are all driven by worm shaft and worm wheel and the design is practically standardized, though there is some variance with reference to constructional details. The trucks are constructed from components of extremely high grade, that are produced by specialists, and which are known almost universally because of their quality.

These components are assembled in a plant that has complete equipment and exceptional facilities for production, and extreme care is taken to build trucks that will be up to a very high standard, so that they will have long endurance, and be very economical of operating cost, but with reference to fuel, lubricants and tires, and upkeep and maintenance.

The character of the construction may be the better understood from the fact that the engines are Continentals, the clutches Brown-Lipe, the transmission gearsets Brown-Lipe and Chase, the rear axles Sheldon semi-floating David Brown worm shaft and worm wheel, the springs Sheldon, the frames hydraulic pressed steel, the ignition systems Bosch, the carburetors Holley and Zenith, and the smaller and less important components are equal to these in quality.

### Standard Type Continental Engine.

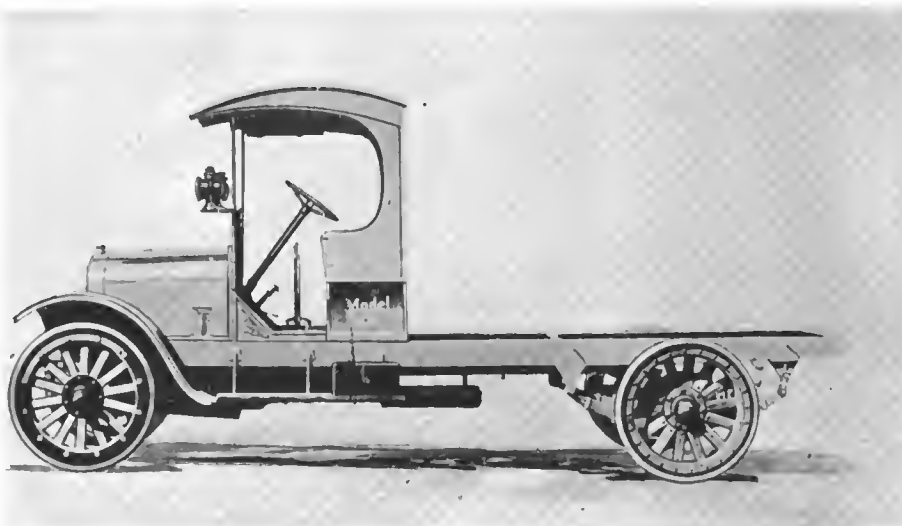
The engine of the model A chassis is a four-cylinder, four-cycle, L head type, with the cylinders cast en bloc. The cylinders have bore of  $3\frac{1}{2}$  inches and stroke of  $5\frac{1}{8}$  inches, the engine having a rating of 19.60 horsepower by the S. A. E. formula. The claim is made by the makers that this engine will develop 23 horsepower at 1000 revolutions a minute and approximately 34 horsepower at 2000 revolutions a minute, so that it is ample in power production for a machine much larger in load capacity.

The standard Continental construction is followed, there being unusually large water jackets cast integral with the cylinders, and these are closed by very large cover plates, with the outlet manifolds in the

centre. As the engine is cooled by thermo-syphon circulation of water, much care is taken to have the cylinder jackets clear and free from obstructions. The pistons are of the same material as the cylinders and are fitted with three diagonally split eccentric compression rings.

### Drop Forged Steel Crankshaft.

The crankshaft is a steel drop forging with three bearings, which are respectively  $2\frac{3}{16}$ ,  $2\frac{7}{32}$  and  $2\frac{1}{4}$  inches diameter from front to rear and are  $2\frac{7}{8}$ ,  $2\frac{1}{2}$  and three inches length in the same order. The fly-wheel flange is forged integral and there is a flange at either side of the centre bearing to take end thrust. The camshaft is a three-bearing type, carried upon bearings of liberal proportions. The connecting rods are 1 section drop forgings and these are fitted with caps that are retained by nickel steel bolts.



Model A Chase Chassis, Load Capacity 2000 Pounds, a Worm Driven Type, Ready for the Installation of the Body.

The crank case is in two sections, the upper, which carries the main bearings, being of aluminum, and the lower section is of pressed steel. There are forward extensions to house the timing gearset and rear extensions that enclose the flywheels. The main and the connecting rod bearings are nickel babbitt that are mounted in brass cages. The connecting rod bearings are fitted with shims by which adjustment for wear are made. The camshaft is mounted in bearings of white bronze and the wristpin bearings are bronze bushings pressed into the ends of the connecting rods. The wristpins are secured to the piston bosses.

### The Valve Mechanism.

The valves are made with nickel steel head electrically welded to carbon steel stems and these seated in ports that are  $1\frac{11}{16}$  inches diameter. The valves operate in long guides in the cylinder block. The valve tappets are a mushroom type that are fitted with adjusting screws and lock nuts. The timing gears are

wide faced and are helical cut to obviate noise.

The engine is cooled by a water circulation through it and a radiator of large capacity, radiation being promoted by a fan carried on a ball bearing on an adjustable bracket and driven by a flat belt from the magneto shaft. The lubrication is a combination force feed and splash system, the oil being drawn from the reservoir in the base of the engine case by a horizontal pump that is driven by an eccentric on the camshaft and forced to the rear main bearing and the timing gearset. The other engine components are lubricated by splash. The oil is filtered and the filtering screen may be removed for cleaning. The current for the ignition system is supplied by a Bosch high-tension magneto and the fuel is drawn through a Holley carburetor.

#### The Power Transmission System.

The clutch is a multiple disc type that is operated without lubrication of the plates, and this is assembled with the Brown-Lipe selective sliding gear transmission gearset as a unit with the engine and clutch. The



The Model B Worm Driven Chase Chassis, Built for Load Capacity of 5000 Pounds, the Largest of the New Types.

power plant is mounted at three points. The transmission gearset has three forward speed ratios and reverse and the shafts are heavy and the gear faces wide to insure endurance.

The drive is by shaft having two universal joints to the rear axle. This is a semi-floating type with the worm shaft, the differential gearset and the driving axles mounted on large annular ball bearings. The axle is so constructed that the worm shaft, worm wheel, and the differential gearset, which are assembled on the cover plate of the central section of the axle housing, may be removed as a unit. The front axle is an I section with large steering knuckles. The hydraulic frame of pressed steel is mounted on long, semi-elliptic Sheldon springs. The axles are fitted with wood artillery type wheels that are shod with 36 by 3½-inch solid band tires forward and 36 by five-inch solid tires at the rear. The wheelbase of the truck is 140 inches and the tread is 56 inches.

#### The Control System.

The steering gear is a worm and nut type with heavy linkage that is adjustable for wear. The ma-

chine is driven from the left side. It is controlled by the usual foot clutch and service brake pedals and a foot accelerator, hand ignition and throttle levers on the wheels, and the gear shifting and the emergency brake levers are in the centre of the footboard. The service and the emergency brakes operate in drums on the rear wheels. Normally 53 per cent. of the weight of the chassis is carried on the rear axle and 83 per cent. of the load is carried by the rear axle.

The speed of the truck is controlled by the governor, which is automatic and is entirely enclosed and sealed. The fuel tank capacity is 18 gallons and the oil reservoir will hold seven quarts of lubricant. The loading space back of the driver's seat is 102 inches length with the standard type chassis. The price of the chassis, with seat and cab and standard equipment, is \$1650 f. o. b. Syracuse. When desired electric starting and lighting equipment is furnished as an extra.

Model B chassis has many of the characteristics of the model A chassis, but the Continental engine is a model C which has a cylinder bore of 4⅞ inches and stroke of 5¼ inches, this having a rating of 27.20 horsepower by the S. A. E. formula, but the claim is made that it will develop 40 horsepower at approximately 1500 revolutions. The construction of this engine is very similar to that already described, the cylinders being en bloc, but it is larger throughout. The crank case, which is cast in two sections from aluminum alloy, carries the main bearings in the upper section. The crankshaft is 1¾ inches diameter and the main bearings are respectively 2 9/16,

three and 13/16 inches length. The main, connecting rod and camshaft bearings are nickel babbitt and main and connecting rod bearings are fitted in bronze cages. The connecting rod bearings are adjustable with steel shims.

The engine is cooled by a circulation of water through the cylinder jackets and the large radiator that is forced by a centrifugal pump of high efficiency. Radiation is insured by a fan carried on a ball bearing on an adjustable bracket that is driven by a flat belt from an extension of the water pump shaft, which also drives the magneto. The engine is lubricated by a combination force feed and splash system, the oil being drawn from the well in the reservoir by a double vertical plunger pump that is driven by an eccentric on the camshaft. The ignition current is supplied by a Bosch high-tension magneto and the fuel is drawn through a Zenith carburetor.

#### The Clutch and Driving System.

The clutch is a multiple disc type that is operated dry and with the Chase transmission gearset, which is a selective sliding gear design having three forward

speed ratios and reverse, are assembled into a unit power plant that is suspended at three points. The drive from the engine to the Sheldon semi-floating rear axle is by shaft having two universal joints, and the construction practically follows the design of the smaller machine. The hydraulic pressed steel frame is carried on Sheldon semi-elliptic springs and the heavy wood artillery type wheels are fitted with 36 by four-inch solid band tires forward and 36 by four-inch solid tires, mounted dual, at the rear.

The wheelbase is 160 inches and the tread is 58 inches forward and 62 inches at the rear. The rear axle carried 59 per cent. of the weight of the chassis and 72 per cent. of the load. The loading space back of the driver's seat is 120 inches with the standard length of frame and 144 inches with the special type. The fuel tank has capacity of 23 gallons and the oil reservoir will contain two gallons of lubricant. The details of the other chassis will apply to this so far as construction is concerned.

The price of the chassis f. o. b. Syracuse is \$2475, this including paint and the cab and driver's seat and the usual equipment. Electric lighting and starting systems will be installed as extras.

#### TRUCKS EXPAND BUSINESS.

In the small towns, as well as the large cities, truck service is not merely replacing horses, but makes possible service that cannot be afforded with horses. The Hudson Doughty Lumber Company of Newton, Kan., which uses KisselKar trucks, has increased its range of operation 15 miles in every direction through the use of its machines. Henry C. Snowden, a hardware dealer of Media, Penn., tells the company that he is covering 50 per cent. more territory with trucks than he did with horses. Frank E. Merrill, a box manufacturer of Turner, Me., often makes 40-mile cross-country deliveries, where he formerly used the railroads. Many instances of similar service are constantly coming to the attention of the Kissel company.

#### A NEW LONDON TRUCK COMING.

Capitalists of New London, Conn., have formed a truck company to produce a truck of standard parts of 1000 pounds load capacity to be put in the market with the name of the New London truck. One chassis was displayed at a recent show in New London. Details of the company's organization and its plans for production have not yet been made public.

#### KLOVE LEAVES SANDOW TRUCK.

N. G. Klove, who from its organization was secretary and treasurer of the Sandow Truck Company of Chicago, has sold his interest in the company to T. L. Beach, its president, and has retired. He will take a vacation before re-entering business.

### STUDYING FUEL PRODUCTION.

#### Better Refining and New Processes Promise to Influence Future Prices.

The recently formed United Motor Fuel Corporation, organized to protect the motor industry against high fuel costs, has engaged in active work of investigation of production or refining and its experts have concluded that an abundant supply of motor fuel at prices lower than those now prevailing is reasonably certain.

No process now in use, so statement is made, does all that can be done in the production of gasoline. No refining process, except the Burton, is yet a demonstrated commercial success, but at least two processes now practically assured will eventually develop into important factors in price reduction.

These conclusions were reached after a careful examination of all processes now in use, of the probable supply of crude oil, of the possibility of using crudes now almost neglected as a source of supply and on a careful examination of all patents since the one issued to Charles H. Hall in 1869. Patents are likely to prove as important in this as in any other industry.

The company has been flooded with all sorts of proposals, but is interested in nothing that has not been demonstrated and is not in actual operation. Of these it has examined three and has two others under consideration. So far it has found nothing to arouse faith in abnormally cheap chemical compounds or secret processes, but an examination is being made of one produced by a chemist of excellent reputation who makes no claim of extraordinary cheapness.

#### NEW RIKER TRUCK CATALOGUE.

A new catalogue of Riker trucks, featuring the slogan "The Best Built Truck in America," has just been issued by the Locomobile Company of America at Bridgeport, Conn. It is handsomely printed and covers all information that is essential for truck buyers. After the introduction a detailed mechanical description of the chassis is given and several pages are devoted to chassis diagrams. There are also many drawings showing the various types of bodies that are supplied for different uses. A considerable section of the book is given over to pictures of Riker trucks now in use in the service of many domestic industries.

#### STANDARD VOLUMETRIC TABLES.

The United States Bureau of Standards, in circular No. 19, has issued a series of "Standard Density and Volumetric Tables," containing measurements for the density of various substances, including petroleum oils. In the new edition the old tables have been rearranged and new tables added. The publication may be had on application to the bureau at Washington.

## THE MACK "A-C" RADIATOR.

### A Circular Construction of Copper Tube That Has Extreme Efficiency.

The Mack "A-C" trucks, built by the International Motor Company, are equipped with a special type radiator which is considered to be superior to anything that has as yet been designed, for it is remarkably enduring and claim is made that because of its construction and location will not fail in any service.

The radiator is a radical departure from existing types because it is built of a large number of semi-circular sections of seamless copper tube, so that with the head and bottom tanks what is practically a ring is formed. This is installed in what may be regarded as the dash, behind the engine, and with it a Renault type head is used.

The ends of the tube are expanded into plates that are in turn bolted to the top and bottom headers of



Two Views of the Ring Type Copper Tube Solderless Radiator Specially Designed for Mack "A-C" Trucks.

the radiator, so that what is practically a solderless construction is obtained. The top and bottom tanks are aluminum alloy, and while the upper section forms part of the dash cowl, the bottom is part of the frame that supports the radiator. Each tube is a unit in itself and any one or a number may be blocked or choked in the event of an emergency without in any manner reducing the efficiency of the radiator.

Being placed within the cowl and ahead of the dash, the radiator is always protected and cannot be damaged by accidents. Through the opening in the ring in the centre the air is drawn by the fan mounted on the rear of the engine, the circulation coming from the driver's cab and the motor compartment and being discharged at the sides. Side screens promote a free circulation of the air.

As an illustration of the degree of expansion and contraction that the radiator will endure, a Mack truck was left out doors a very cold day. The water in the radiator was frozen solid, and so great was the strain upon thawing that the lower section of the bottom

header burst, but the tubes remained intact. Replacing the broken header was a comparatively easy work. The bolts were removed from the two plates holding the tubes, after which the header was taken out of the chassis frame and replaced by a new one.

### TAKES STEGEMAN NEW YORK AGENCY.

The Knickerbocker Motor Truck Manufacturing Company, located at 151st street and River avenue, New York City, has taken the New York sales agency for Stegemann 1½, 2½, 3½ and five-ton, six-cylinder trucks with electric starting systems and worm gear drive. The machines are made by the Stegeman Motor Car Company of Milwaukee, Wis. The sales territory will cover 23 counties within 75 miles of New York.

The Knickerbocker company will continue to manufacture the five-ton, four-cylinder chain drive truck which it has produced for four years and will enlarge its service department to take care of all classes of motor vehicles. Herbert H. Murden will continue as general manager, engineer and sales manager, while Richard V. Brady will be the purchasing agent.

### WILL BUILD \$1000 TON TRUCK.

A plant in Long Island City, near Woodside, has been taken over by the Clyde Motor Truck Company, which was recently incorporated in Delaware, with \$500,000 common stock and \$250,000 preferred stock, for the production of a one-ton truck to sell for \$1000. Deliveries are expected in July. The truck will be assembled and will be equipped with a Buda engine.

M. C. Swartz, a real estate operator, is president of the company; W. F. Melhuish, formerly president of the White Company, is vice president; J. F. Mason is secretary and E. E. Vreeland, an advertising man, is treasurer. Among the directors are P. R. McLean, a director of Fraser & Best, Ltd., Australian exporters; Walter Kenlon, son of Fire Chief John Kenlon of New York City, and P. J. Holdsworth.

### UNITED STATES GREATEST EXPORTER.

Figures compiled by the National City Bank of New York City show that the United States, which is normally the third nation in volume of manufactured exports, was first last year, owing to the reduction by the war in the exports of Great Britain and Germany. The total volume exported from the United States—including of course munitions—had a valuation of \$1,784,000,000, and those from Great Britain, notwithstanding the war, totaled \$1,426,000, a decrease from \$2,001,000,000, the preceding year. Germany went down from \$1,607,000,000 in 1913 to a small amount that is not definitely known last year. In the last normal year the exports of the United States were valued at \$1,177,000,000.



## ENGLAND TURNING FROM RAILROADS TO TRUCKS.

**Large Companies, Some with American Machines, Giving Faster and Direct Delivery Service Between Commercial Centres—French War Truck Problem.**

A GREAT English trucking system is being organized to transport freight from the Liverpool docks to Manchester and the textile district about 40 miles back into the country from that port. It is to take the place of railroad haulage.



**Bessemer Two-Ton Truck Used to Inaugurate Service Between London and Birmingham.**

The plan has much interest for Americans, especially in the West, where it is proposed to develop the rivers in connection with the motor truck for moving freight more cheaply than the railroads are able to do it.

In times of peace this plan was often considered, owing to the comparatively short distance of the haul and the great quantities of material that must be moved over this route. The conditions are especially favorable because the vast amount of raw material for the textile trades that is received at Liverpool. This is taken inland to factories and then from 70 to 80 per cent. of it is returned to the docks for export.

This makes it possible to provide the trucks with a load both ways. Before the war there was some question as to the relative cheapness of the service as compared to the railroads, owing largely to the fact that trucks would be greatly delayed at the docks in getting their loads. It was something which, to be successful, must be organized on a large scale.

But during the war freight rates have advanced enormously and the railroads have been so congested with government work that they could not afford prompt service to industrial interests.

A company with large financial backing has now been formed. It has purchased 41 three and six-ton Garner trucks and has purchased in addition a great number of American trucks, delivery on which is now awaited.

These will go into service at once. If delays in direct loading at Liverpool are found to be too great the goods to be transported will be assembled by small trucks or horse teams at a central warehouse, where they will be loaded on removable bodies. These will be placed upon the trucks immediately upon their arrival so that the machines can be kept constantly in motion.

### TRUCKS FASTER THAN FREIGHT TRAINS.

Birmingham Garages is the name under which a large Midland company operates garages, sells cars and supplies and rents and employs in work for hire both passenger and freight vehicles. This company has the local agency for Buick light trucks.

This service has not been planned so much to take care of heavy loads, but to provide a rapid means for the collection and delivery of goods of smaller bulk and parcels that formerly were sent by train.

For large consignments, one or two of which will load a truck, it is possible to make collection in the morning in Birmingham or London and deliver them the same day in the other city. But where many stops are necessary during a trip collections are made one day and deliveries the next. These are delivered ready for shipment at the garage and at the London terminal are turned over to established parcel delivery companies, which distribute them.

The service has been begun with a two-ton American Bessemer van, which made its first run on Dec. 6. From the first it secured a full load six days a week.



**Part of the Delivery Fleet of a Manchester Furniture Firm Used for Long Distance Haulage.**

Arrangements were then made to install five more trucks on the run. Depots will be established along the route to pick up and leave consignments for inter-



One of the Uses for Army Trucks Abroad—Recovering a Touring Car from a River "Somewhere in France."

mediate towns. The retardation of railway service, owing to the necessity of doing war department work first, promoted the demand for motor transportation by highway, and has stimulated patronage.

#### Trucks Develop Large Trade.

Messrs. Kendal, Milne & Co., of Manchester, a large furniture house, uses a considerable number of trucks in its delivery service. It began with two in 1908 and has steadily increased its vehicle equipment. The machines are both light and heavy and are the products of several of the leading English makes. The company also uses a number of steam trucks.

The business has been enormously increased by extending it to all the towns about Manchester. Delivery of furniture from store to customer by railroad is especially difficult in England, as such shipments must be accommodated by men to look after them. Business outside of the city was regarded as almost impossible before the trucks were used. A very large and profitable patronage has been developed that could not be obtained without motor shipments.

While in some cases the firm finds delivery by motor truck more expensive than by horse vehicles, these instances are comparatively few, save in the city and close to the store. A few horses are maintained for short haul work.

#### Lack of Horses Promotes Truck Use.

Owing to the shortage of horses in England, and the fact that all of the gasoline trucks of well known makes are required for war department use, the municipal council of Chiswick was forced to try the experiment of adopting steam wagons for city service.

The bodies are very low and of large capacity. They are fitted with vacuum apparatus for cleaning out gulleys and pulling wet

slop into the body and doing general sanitary work.

#### Great Shortage of Cab Drivers.

So many motor drivers have been absorbed into the English army that there is a great shortage of taxicabs in London and large cities. Charges have been made in the English press that the men who now drive cabs, feel sure because of the shortage of competent men, that they will not lose their jobs, have become impudent and accept as passengers only those persons whom they feel assured will be most liberal with their tips.

There has been a strong movement to relax the Scotland Yard requirements for drivers to permit women and boys to drive. This is strongly objected to by some on the ground that the lighting regulations which leave the streets almost dark make it harder to drive a cab in London than it ever has been, and that there should be for that reason no relaxing in the regulations concerning drivers.

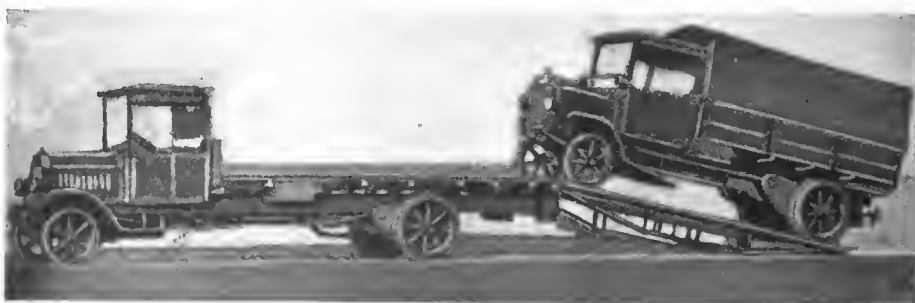
The darkened London streets are said to have injurious effects on the nervous systems of the London omnibus drivers. Some of the older men are said to have suffered nervous prostration. They are in constant fear of their vehicles coming into collision or striking pedestrians and have many hair breadth escapes from accidents.

#### TO USE WAR TRUCKS ON THE FARMS.

The French officials have been considering very carefully the problem of disposing of the vast number of trucks that are now used by the army for war purposes. In the usual thrifty French manner of accomplishing two or three objects at once, the government has worked out a plan by which there is hope of disposing of the trucks and at the same time make up for the great shortage of horses, which will make farming a serious undertaking after the war.

The badly worn war trucks are to be converted into stationary and traction engines for the farms. The motors of the trucks that are in very bad condition will be removed and these will be mounted for stationary engine purposes in agricultural work.

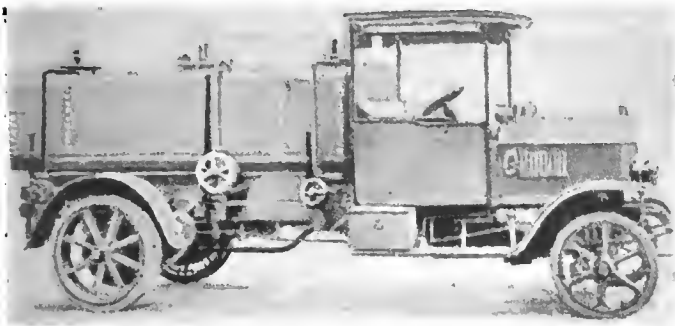
It is proposed to change the design of the less worn machines and adapt them so they can be used as farm tractors. This will involve fitting new rear wheels with wide spiked steel tires, and perhaps strengthen-



A Truck Equipped for Service with the German Army to Carry Disabled Machines to the Field Repair Stations.

ing the transmission systems and axles and reducing the gear ratios.

As most of the farms in France are small, it may



A Benz Truck Fitted with Tanks to Supply Fuel, Oil and Water to Field Trucks—A German Army Equipment.

not be possible for individual farmers to take over the trucks, but the government will assist in organizing associations to own and control motor implements and to do the work of the community.

At the end of the war the army is certain to have more trucks than can be used in industrial hauling and selling these in the open market would probably paralyze the truck manufacturing industry. There is sure, also, to be great need of mechanical farm power, as there will not be sufficient animals available.

This plan, if it can be worked out practically, will solve both problems at once.

### ENGLAND WILL BUY FARM TRACTORS.

English experts who have been following the farm tractor situation, declare that practically any machine that will pull a plow can be sold in England at this time, owing to the shortage of men and horses. W. G. Malden, who read a paper before the Farmers' club in London recently, predicted great progress would be made in English agriculture because of the new conditions.

Farmers, he said, have been slow about introducing machinery because of a sentimental regard for their farm laborers, and they had wished to wait before buying motors until their success was more firmly established. Now, however, they were forced to change and progress, he thought, would be much more rapid than it would if the war had not been declared.

### SPECIAL GERMAN WAR TRUCKS.

The Benz factory at Gaggenau, Germany, has been largely devoting itself since the war began to producing motor trucks of special design for the use of the German armies. Most of these trucks have 50 horsepower motors and radiating systems of large capacity, so that the motors will be kept cool while running steadily under full load.

One type of these special trucks is a tank wagon.

It has a large centre compartment for gasoline or benzol and smaller end compartments for lubricating oil and water. Others are fitted with special multi-compartment bodies for carrying stocks of repair parts, and there are many motor machine shops on Benz chassis.

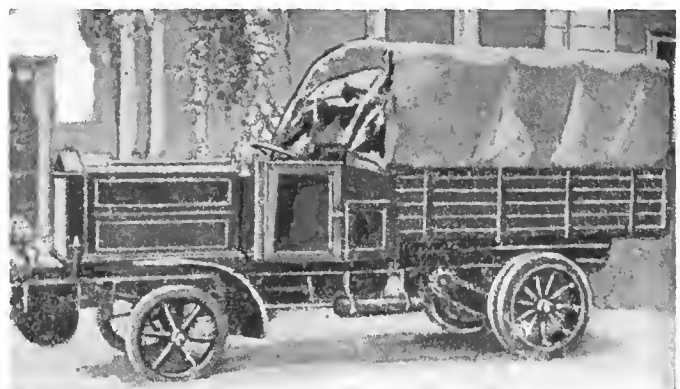
A type of truck is built which is used to rescue from the enemy broken down or damaged trucks. It has a very long platform body and is fitted with skids up which another truck can be run or raised to get it aboard. Behind the driver's seat is a windlass to which a cable is attached with which the wrecked truck can be drawn onto the platform. These trucks are useful in preventing disabled trucks from falling into the hands of the enemy in case of retreat.

A tractor known as the Bussing has been used with very good results. It has proven that it will pull loads as heavy as 25 tons up an 11 per cent. grade on a trailer and five tons additional is carried on the tractor itself. It is equipped with a windlass for pulling it on to solid surfaces when the ground is so soft that traction cannot be had.

### USE ELECTRIC ROAD ROLLERS.

There is likelihood that electric storage battery road rollers of from eight to 10 tons weight will take the places of the steam rollers of larger size that are now used for road work, especially where the material is bituminous. For an eight-ton roller the weight of the batteries necessary to keep it going for a 10-hour day would be about a ton and a half. The electric control would make handling the roller very much more easy and improve the quality of the work.

In England the electric truck for commercial purposes has been very slow in coming into use. But at present the scarcity of horses, the high price of gasoline and the fact that much of it is commandeered for the use of the army will accelerate its introduction. The English have used many steam trucks, however, and in ratio to the number that the manufacturers are able to turn out in war time that form of traction is likely to be benefited.



A Bussing Tractor, Winch Equipped, Built for Hauling Trailers Used by the German Army.

## WILL BUILD LIGHT TRUCKS.

### Thomas Company to Manufacture Especially for New York Use.

Taking advantage of what it perceives to be a general tendency of business to localize the Thomas Motor Truck Company has been formed in New York City to build trucks for New York trade and to sell them from factory direct. The parts used will be purchased chiefly in the territory adjacent to New York, and the truck will be designed to meet as fully as possible the operating conditions of that limited territory.

Charles K. Thomas, former president of the Federal Motor Truck Company of New York, is the head of the company. The series of trucks will consist of  $\frac{3}{4}$ , one,  $1\frac{1}{2}$  and two-ton capacities. Deliveries are to begin this month and statement is made that the company's production for the first two months has already been sold.

In addition to Mr. Thomas the following men are prominent in the management of the company: Cloyd Marshall, secretary and treasurer, formerly of the C. W. Hunt Company, New York; William S. Thomas, director, an engineer; O. S. Platt, director, owner of the Platt Pattern and Machine Works, Bridgeport, Conn.; Philip F. Donohue, director, advertising expert and treasurer of Tammany Hall; George E. Whitney, M. E., Bridgeport, Conn., formerly chief engineer of the Locomobile Company of America; M. D. Herron, sales manager, formerly sales manager of the Federal Motor Truck Company of New York, and Walter A. Jones, chief engineer.

Koehler one-ton truck agencies have been placed with the Thurmont Garage, Thurmont, Md.; N. R. Zimmerman, Doylestown, O.; Heller Sales Company, Wapwallopen, Penn., and F. R. Renz, Pana, Ill.

## NEW STANDARD TRUCK PLANT.

### Plans Adopted for a Concrete Structure that Will Cost \$200,000.

Plans have been completed and construction is to begin immediately on a new factory for the Standard Motor Truck Company of Detroit, Mich. Land has been purchased between Lafayette and St. Paul avenues on the Michigan Central Belt Line railroad.

The plans were drawn under the direction of President Fisher of the truck company, who also planned the plants of the Fisher Body Company and the Universal Truck Company and has had much experience.

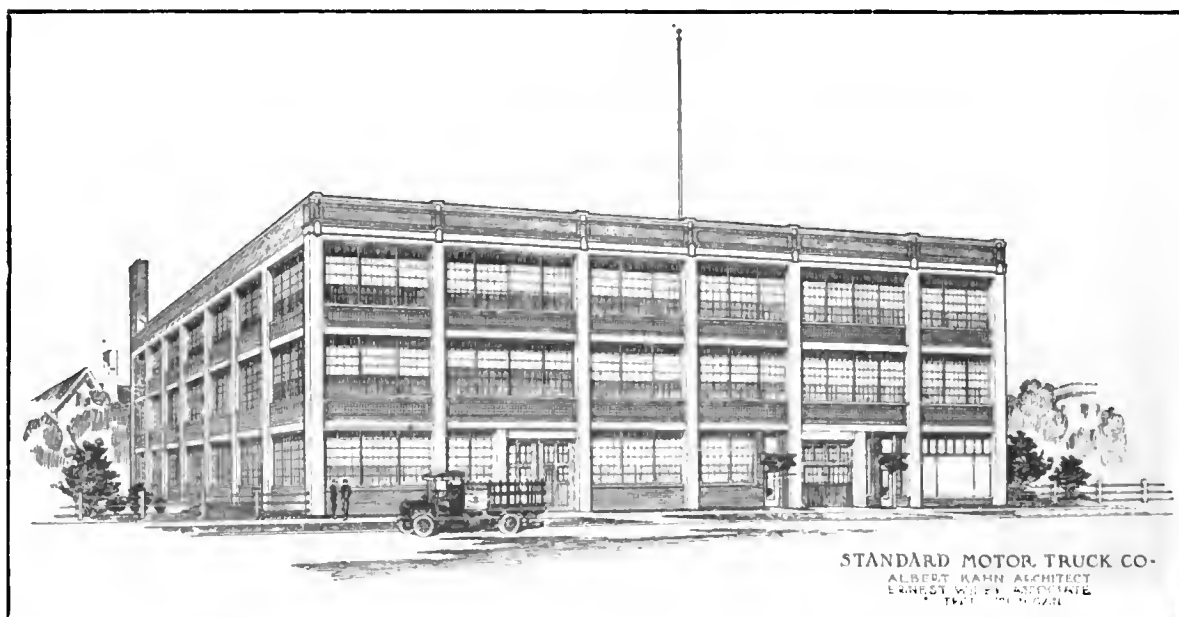
The building is to cost \$100,000 and the new machinery which will be installed will cost another \$100,000. The structure will be a three-story reinforced concrete type. The main entrance will be decorated with stone with an ornamental marquet over the walk. Each floor will have 60,000 feet of floor space. There will be a special service department, which will be in operation night and day.

The shipping and receiving departments will be on the main floor, with the blacksmithing and assembling departments. The offices will be in the front of the second floor. The stock rooms and wood working department will occupy the rear of this floor. The front of the third floor will be a show room, while the rear will be given over to painting, varnishing and trimming departments.

### DEMONSTRATING TRUCK AT FUNERAL.

An undertaker at Waukegan, Ill., recently had three funerals in a single day and as he knew that his horse drawn hearse could not do the work necessary in connection with them, he asked J. R. Conrad, local agent for Vim trucks, to loan him a machine with which to take the mourners and caskets to the cemetery.

Three prospects of the truck dealer were invited to accompany the funerals and were so much impressed with the service of the trucks on 74 miles of bad roads that three chassis were sold to them.



Architect's Sketch of the Three-Story Concrete and Steel Building Now Being Erected for the Standard Motor Truck Company at Detroit, Mich., for Manufacturing and Administrative Purposes.

### HANDLING OVERHANGING FREIGHTS.

The distribution of loads on motor trucks is often difficult when the form of the freight to be carried is much in excess in length and width of the loading platforms of the bodies. Good judgment dictates that the loads shall be carried so that there shall not be undue stresses upon the axles or wheels or springs, for with a comparatively light freight considerable damage might be done if the construction is over burdened.

But a man who understands the manner machines should be freighted can very often so place a very bulky or heavy load so that the weight will be reasonably if not perfectly distributed. Those who value the service of their machines are careful of them, and an example of what good judgment will accomplish is shown in the accompanying illustration.

Richard DeCou, a steel and iron dealer of Philadelphia, Penn., had to deliver two steel I beams that were each more than twice the length of his four-ton Packard truck. To place the beams, which were 42 feet eight inches length, and weighed 65 pounds to the foot, required care, but they were set on the sides of the platform, with the forward ends considerably ahead of the radiator, and were quickly delivered after the start was made. Finding the point in the length where the weight on each truck axle was approximately the proportion determined by the builder was the main proposition. When this was done loading was comparatively easy.

### MOTOR TRUCK PREPAREDNESS.

The Pennsylvania Section of the Society of Automobile Engineers devoted its meeting on April 26 at the Engineers' Club in Philadelphia to an address by Major Francis H. Lawton, U. S. A., on "How Automobile Engineers Can Help in Motor Truck Preparedness."

### ARMY TRUCKS MAKE EIGHT MILES.

The trucks that are used by the United States army in Mexico and elsewhere, according to records up to the present time, have been driven about eight miles to the gallon of gasoline consumed, with a few drivers getting 11 miles. Since the troops have been far into Mexico a round trip means about 700 miles, so that nearly 100 gallons are required for the round trip. Gasoline is selling for 21 cents a gallon wholesale, but that which is shipped into the interior of Mexico has to pay a customs tax of four cents, and costs the government nearly 30 cents per gallon. The expedition has been using about 7500 gallons a day.

### MOTOR FIRE APPARATUS COST.

#### Boston Employs Expert to Observe Equipment and Improve Its Economies.

To make a detailed and scientific study of the methods of operating the \$257,000 worth of motor equipment in the service of the Boston fire department, Prof. Charles E. Stewart, a former instructor in a technical school, has been made supervisor of motor apparatus and already has inaugurated a campaign by which he hopes to save from \$15,000 to \$20,000 a year in the cost of operating the apparatus.

He is collecting and arranging detailed data showing just where expense originates and how to eliminate it. He is to train chauffeurs by a course in shop work and to make periodical inspections of all motor vehicles.

Most of the expense he finds comes from minor mechanical weaknesses and when his data sheets are complete the department will be able to avert most of this cost by refraining from purchasing apparatus on which they frequently happen, or finding means to obviate them.

He has found that the great vibration in motor apparatus often snaps off gasoline feed lines and has used a safety coil which insures against this trouble. Another difficulty experienced during the winter was that anti-skid chains would break and become tangled with drive chains. Next winter the chain drive vehicles will be equipped with guards which will prevent such accidents.

Records are being kept on all tires and oil to determine by experience which are the cheapest and most serviceable in the long run.

### YELLOW TAXI SYSTEM POPULAR.

Success of the yellow taxicabs in Chicago, which do not have regular stands, but cruise the streets looking for fares and are called by a signal system, has proved so popular that it is to be installed in other cities. The company makes its own cabs and will sell a fleet, together with a signalling apparatus, to local interests in any city. Such a system in Kansas City already dominates the business there.



Four-Ton Packard Truck, Owned by Richard DeCou, Philadelphia, on Which a Load of Steel Beams is Carefully Equalized.



## **GARFORD ROADS CAMPAIGN.**

### **Endeavor Making to Obtain Co-Operation of Industry in Highway Improvement.**

The desirability of the entire motor industry co-operating in a campaign for the improvement of roads throughout the country is being consistently advocated by S. M. Williams, general sales manager of the Garford company of Lima, O.

This proposal was considered for about four weeks by the National Automobile Chamber of Commerce, which decided that giving combined support to a good roads movement would be too radical a step to be taken by the industry.

The Garford company has continued the campaign, however, and has circulated among farmers and good roads workers hundreds of thousands of copies of a booklet on the value of good roads prepared by S. M. Williams.

Effort has been directed also to securing the co-operation of the dealers in good roads movements, as well as the manufacturers. A letter was sent recently to all manufacturers in the industry, pointing out to them the reasons why they should get behind the good roads movement, even to the extent of spending a portion of their advertising appropriations for good roads agitation.

The letter relates the result of a canvass of the dealers of the country who were asked to state in their opinion the effect of bad roads on their business and the extent to which their sales would be increased if all the roads in their territory were surfaced.

Tabulation of the returns showed that 2565 out of 3440 dealers who replied that the condition of the roads in their territory was from "bad to fair," the latter condition being in dry weather.

Replies from 906 dealers state that bad road conditions prevent the satisfactory use of the motor car from 25 to 50 per cent. of the year; 574 from 50 to 75 per cent. of the year, and 167 from 75 to 100 per cent. of the time. It is stated by 1136 that permanently improved roads would increase the sale of motor cars from 25 to 50 per cent.; by 642 from 50 to 75 per cent., and by 267 from 75 to 100 per cent.

These figures show that bad roads are a great handicap to the dealers' business in both trucks and passenger cars. Less than 10 per cent. of the roads of the country guarantee the economic and dependable use of motor vehicles the year round.

Mr. Williams points out that a great deal of literature in the interest of good roads is sent out, but that inquiries he has made have indicated that most of the mailing lists are made up of automobile owners, who are invariably good roads workers anyway. On the other hand, the farmers, whose political power in 1914 defeated \$60,000,000 in issues of good roads bonds, have a great deal to gain by good roads work, but they do not yet appreciate the fact.

Mr. Williams believes that if the manufacturers would spend some of their advertising money in getting the true state of facts before these people the development in good roads work would be enormous and that in a short time the expansion in the motor vehicle market would more than pay back to the manufacturers their expenditure.

The Garford company, which has been pressing its campaign alone, is prepared at any time to withdraw in favor of a co-operative movement in which the whole industry would have a part.

Letters of commendation on the Garford campaign have been received from hundreds of public officials, corporations and individuals. The subject has aroused a tremendous public interest and its agitation has been of great aid in obtaining ballot approval for road bonds in many instances.

## **TIMKEN SELLS AXLES ABROAD.**

Many makers of motor cars in Europe and other parts of the world are adopting to some extent the American plan of buying parts. A large order for passenger car rear axles was recently received by the Timken-Detroit Axle Company from the Spyker Trompenburg Company, the only motor car maker in Holland. This concern builds high class seven-passenger cars. Sixteen days after the order was accepted and the details worked out the axles had been manufactured and tested and were on their way to the coast for shipment. They completely filled a large automobile box car.

Timken-Detroit axles for both passenger cars and worm driven trucks have been used recently in Great Britain, France, Holland, Russia and Sweden.

## **NORWAY WANTS ELECTRICS.**

There is considerable interest in Stavanger, Norway, where the fisheries and canneries which produce the famous Norwegian sardines are located, in American electric trucks, and the United States consul located there believes that from 20 to 30 trucks might be sold. The street grades in the town are very steep and the trucks would be used in hauling fish and cans short distances from the wharves and back again after the canning processes were completed. They would have to operate over rough cobble stone streets. Current is available for the trucks. This is an opportunity for American truck manufacturers to investigate.

## **BOSTON ADOPTS STREET FLUSHERS.**

Boston has abandoned the old fashioned circular brooms for street cleaning and is using six motor street flushers with a capacity of 800 gallons on all hard surfaced streets. These flush the streets at a pressure of 80 pounds and suppress the dust that was caused by the old fashioned brooms.

## DETROIT'S MOTOR INDUSTRY.

### Census Figures Show Its Product Is 40 Per Cent. of City's Total.

The United States Census Bureau has given out figures of the 1914 census of manufacturers which relate to the automobile industry in Detroit. These show that there were 120 establishments in the city manufacturing automobiles and motor trucks, bodies and parts. These represented an investment of \$82,561,000 capital out of a total investment of \$295,171,000 in manufacturers for the whole city. The concerns employed 37,641 persons, or nearly one-fourth of the 120,977 engaged in manufactures in the city. Salaries and wages were paid by the industry to the amount of \$32,717,000 out of \$96,158,000, or a little more than one-third.

Automobiles and parts to the value of \$163,588,000 were produced in the year, which is equal to 40 per cent. of the \$402,864,000 value of all manufactures. The industry paid for materials \$101,259,000 out of the \$223,527,000 paid by all the manufacturing trades, or 45 per cent., and added \$62,329,000 to the value by manufacture. Each of 31 establishments produced automobiles, trucks or parts to the value of \$1,000,000 or more, 30 to values between \$100,000 to \$1,000,000, and 32 to values of from \$20,000 to \$100,000. The primary power used to operate the factories aggregated 38,964, or 21½ per cent. of all the power required for manufacturing in the city.

The busiest production season was in the late winter and spring, when the largest number of wage earners were employed, in February the workers numbered 35,088, in March 36,193 and in April 36,089. Eighty per cent. of the wage money went as wages and 20 per cent. as salaries, while in other industries 68 per cent. of the wage money went to wage earners. The value of the product was double that of capital invested, while in other industries it averaged 112½ per cent.

### STARTS WITH BIG CAPITAL.

The American Motor Truck Company has been incorporated under the laws of Delaware with a capital of \$3,000,000 to manufacture, sell and deal in various kinds of motor trucks, engines and so on. The incorporators are H. H. Walker, Theodore B. Hoy and George E. Touloupoulos of New York.

### ROAD MACHINE EXHIBITION.

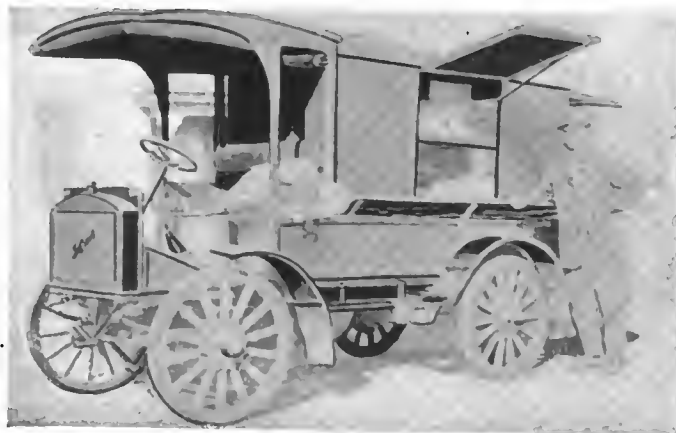
An exhibition of trucks, tractors and other equipment for road builders was held at Savannah, Ga., May 23 to 25, at the convention of the Georgia Society of Wardens and Road Superintendents. It was placed at the fair grounds and was under the direction of Harry Rose, secretary of the society.

## TRUCK DEPARTMENT STORE.

### Taking the Market to the Farmer Proves a Profitable Business for Trader.

Business as carried on by W. Frele of O'Leary, Ia., has proven to be more than ordinarily profitable because he has developed it so that he has practical control of the patronage of a considerable number of people who reside in the farming sections about the town.

Mr. Frele is a trader in the broadest sense. He will sell to his farmer customers for cash, or will take from them produce of any kind in payment for their purchases, and in turn will dispose of what he has exchanged for his own goods to the store keepers of the town. In this manner he has two markets to serve and he is of necessity in closest touch with them both, because he can only profit from what may be regarded as small margins.



The Little Giant Truck That Is the Store of W. Frele, a Country Trader of O'Leary, Ia.

Mr. Frele originally started with horses, with which his routes were limited and of course his loads were comparatively small. Three years ago he bought a Little Giant truck and on this was installed a specially built body, which is so designed that in it stock can be conveniently packed and carried and displayed whenever there is occasion to show it.

According to T. J. Hudson, sales manager for the Chicago Pneumatic Tool Company, the truck is stocked with everything from a needle to a suit of clothing, and with this routes are traversed regularly and the customers are saved the time that would be necessary for them to go to the town, they can have special order of any kind delivered on time, and they can dispose of their own products at the prevailing prices.

Mr. Frele can with the truck cover a great deal more territory than would be possible with horse teams. He says that he has sold his horses, because they are no longer profitable, and he does not believe that in any event he would consider using them again.

## CHICAGO'S MOTOR EQUIPMENT.

### Service Found to Be Very Economical by All the City Departments.

While the motorization of the equipment of the various city departments in Chicago has not progressed as far as it has in some other cities, there is a keen appreciation among city officials of the greater efficiency and economy of motor vehicles and they expect cars and trucks will eventually replace all horses. New police and fire stations are being built only to accommodate motor apparatus.

The fire department which began to buy motors in 1915 is now only about 30 per cent. motorized, although the motor equipment was increased by 30 per cent. last year. At the present rate it will take nearly 20 years to replace all horse apparatus.

In the five divisions of the city service in which motors are used there are at present in operation about 175 cars which cost from \$300,000 to \$350,000. The number of hired cars is about 50.

The fire department has 90 motor vehicles. The total of touring cars and runabouts in the department is 40, there are 25 chemical and hose wagons, three squad wagons, six pumping engines, 15 tractors and only one motor driven steamer.

The police department is five-eighths motorized and it is now and has for years been building its own cars. It buys the parts, assembles them and constructs the bodies and installs the electrical systems, as well as doing all its own repairing. This keeps a large force of machinists busy and the department is equipped to make quick repairs at all times so that the machines are almost continuously in service.

In addition to doing the repairs the shop turns out two new machines every month. These cost about \$2500 each, but if purchased would probably cost \$3000. Only 16 stations still have horse patrols. This year from 12 to 18 patrols and ambulance will be built.

Very close records of all the motor vehicles used by the city are kept and expenses are figured down to the cost per mile and cost per ton-mile. Under the direction of the city engineer a municipal garage is being built. Eventually it is expected that all the city's cars will be kept there. An underground tank for gasoline holding 1200 gallons has been installed and oil is being bought in car load quantities.

A five-ton truck operated by the engineering department shows a cost per mile of \$.398 and a cost per ton mile of \$.17. The bureau has a motor especially equipped with apparatus to put pressure on a water pipe to test its strength before it is laid. The meter division finds motor trucks very economical because of the long distances its men have to travel.

The bureau of electricity owns 10 or a dozen cars and rents 39 cars from its own employees, who drive them. The light cars used by the men are paid for at the rate of \$3.75 a day and one truck is operated for

\$3.25 a day plus six cents a mile for every mile over 20. This system of compensation has been found to be satisfactory because the men are very careful about taking care of their own property and drive with the greatest economy.

### CAN'T COMPARE TRUCKS AND HORSES.

Investigations by the Kissel Motor Car Company, Hartford, Wis., in an effort to get accurate cost figures on motor trucks as compared to horse delivery, have shown that it is almost impossible to compare the two. The reason is that the trucks cover areas and perform work that would be impossible to do with horses. The use of trucks has almost invariably resulted in expansion of the owner's business over a greater area.

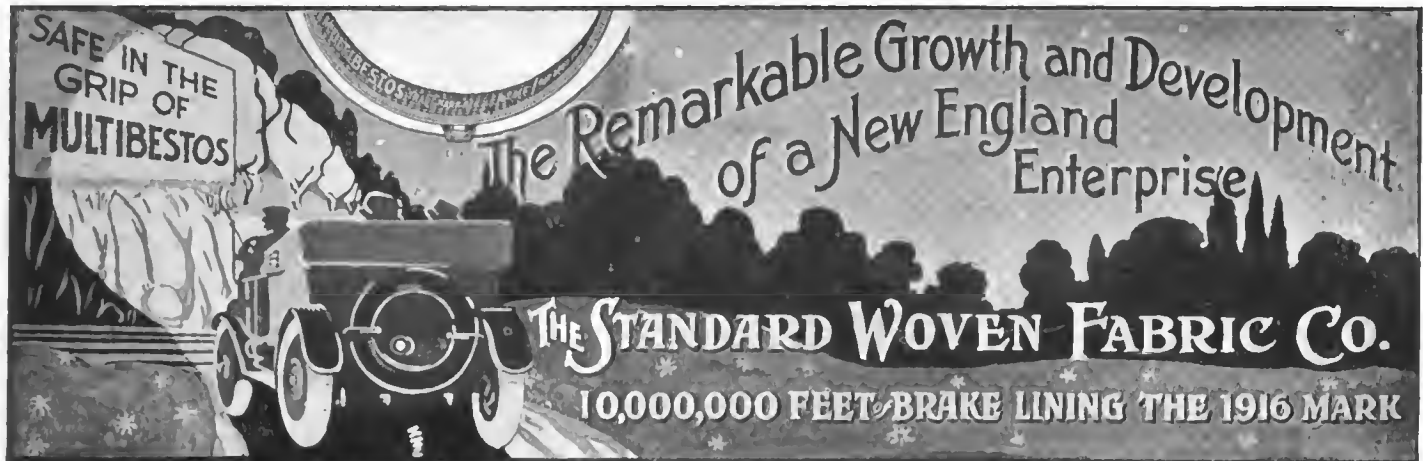
The company sends out blanks to owners to get figures on comparative performance and a typical blank will show that where a truck has replaced one work team the latter formerly covered from five to 20 miles a day, while the truck makes from 15 to 50 miles a day. This means that a business man who from haulage limitations confined his business to a small radius has sought patronage in a much larger area as soon as trucks were utilized, which is entirely practical at a reasonable cost. That they can do the work of two or three horse drawn outfits is a big argument for trucks, but even more important is the capacity to cover two or three times as much ground as a single horse drawn rig.

### KIRKE MOORE IN VIM TRUCK.

D. K. Moore, former sales manager of the Weston-Mott Axle Company, and in charge of purchasing after the company was taken over by the General Motors Company and a sales department was no longer necessary, has joined the Vim Motor Truck Company, in the capacity of assistant general manager. Because of the rapid development of business General Manager H. B. Lazerlere has felt the necessity of a strong assistant to aid in building the organization. Mr. Moore has had long experience in the industry in important executive positions.

### G. M. C. BUYS 25 ACRES IN DETROIT.

A tract of 25 acres in the northeastern part of Detroit has been purchased by the General Motors Company adjoining a 58-acre lot which it purchased three years ago. President Nash explained that the purchase was made to safeguard the Cadillac Motor Car Company in case it should find it desirable to locate its plant all in one place. At present the departments of the Cadillac company are considerably scattered. The site would provide space for a much larger plant than were the present Cadillac buildings combined.



AS ONE watches motor cars weaving through the congested traffic of a city's streets, stopping instantly when collisions seem imminent and continuing when there is a clear passage, he is impressed by the absolute control of the driver of the powerful car he guides so easily. It is a striking demonstration of man's mastery over a complicated mechanism that is vastly more powerful than the strongest human being.

The impression becomes more profound when one considers that this control is largely possible through the operation of a comparatively narrow band of fabric which has been spun and woven out of rock mineral. The conception of the importance of this band, the brake lining, in the operation of motor vehicles, grows in proportion as one realizes that it is the one safeguard against accident and disaster when traversing the highways of the country, particularly on steep hills and at cross roads.

One may conjecture a car load of tourists rushing down a steep grade at the maximum rate permissible by the law.

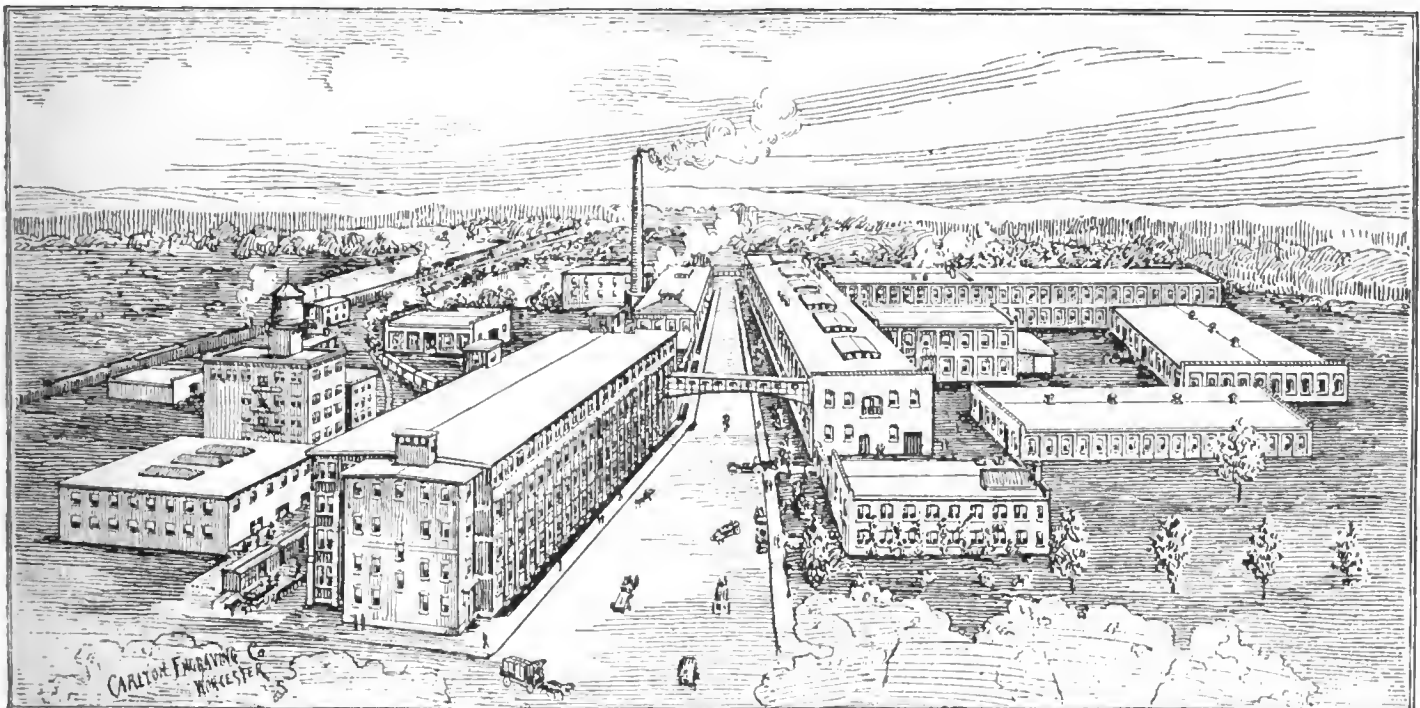


"The Cradle" of the Standard Woven Fabric Company, the Original Plant at Worcester, Mass.

The motorists are gay from the exhilaration of the drive, with never a thought of danger. Suddenly from a cross road dashes another automobile, or possibly a group of school children run into the way. It is then that the brakes must be used quickly and be highly efficient to avert injury or death. That efficiency is largely dependent upon the condition and quality of the brake linings. If these fail the safety of every person may be threatened.

It probably was with such needs as these in mind that an eminent engineer declared that it is more important to stop than to start a motor car. A brake incorporated in a motor vehicle does not necessarily mean that the driver has absolute control of it; the brakes, and particularly the linings of the brake shoes, must be in perfect condition for effective operation. The brake shoes are vitally necessary parts of cars, and one automobile engineer has said that owners should be required by law to have brakes that will have certain efficiency standards, just as they now are compelled to have lights, numbers, etc.

This emphasizes the importance of brake linings, a part of the car of which few motorists have thorough knowledge, even though the brakes are so essential to the safety of those who ride in power driven vehicles. A stiff black band of rough material, it has no attractions for the observer. But its use is almost constant and to insure efficiency care must be taken to have it so that its fullest utility may be realized when needed.



The New Home of Multibestos at Walpole, Mass., a Huge \$500,000 Plant, Containing 175,000 Square Feet of Floor Space and Equipped with the Most Modern of Machinery—The Facilities of This Plant Will Bring the Production of Multibestos up to 35,000 Linear Feet Daily During 1916.

The brakes must be always well adjusted and they must be used intelligently, else there will be unnecessary and destructive wear.

The reader should fully understand the composition of the fabric by which his life and property are safeguarded every time he drives or rides in a car on the highway. He should know how necessary it is that the brake shoes or bands be faced with bands of fabric which will resist the tremendous heat that is generated every time the brakes are applied to stop a car.

#### Early Types of Brakes.

In the infancy of the automobile industry, car builders equipped their machines with brakes of the metal to metal type. At first this practise was almost universal, chiefly because no satisfactory facing was known. At the beginning of the 20th century automobile brakes were faced with leather or cotton fabric. Both wore quickly, became charred and brittle, failed to clamp the drums satisfactorily when saturated with gasoline, oil or grease, and were rapidly cut by such abrasives as found lodgment on their surfaces.



Arthur H. Burdick, Treasurer and General Manager.

As the speed, power and weight of motor vehicles became greater, the industry sought a friction material that would adequately meet its requirements. Engineers searched assiduously and finally the solution was found in asbestos. This rock mineral has exceedingly high powers of heat resistance and is a non-conductor of heat. It has qualities that are ideal for frictional brake purposes, but how to adapt it was the next problem. In its original state it was difficult to so utilize it that it would not disintegrate under pressure, or would not glaze or wear to uneven surfaces.

Among those who experimented with the problem of adapting asbestos for brake lining were the engineers of the Multiple Woven Hose and Rubber Company, which, in its plant at Worcester, Mass., was engaged in the manufacture of solid multiple fire hose fabrics and solid cotton belting. This company was peculiarly qualified to undertake this work, its equipment including weaving and treating machinery and its management being thoroughly versed in the construction of such machines. The company worked out the practical solution of making asbestos fabric suitable



Stoughton Bell, President of the Standard Woven Fabric Company.

for brake lining by building special looms for weaving it and compounding a chemical formulae for treating the bands. As a result it began the production of Multibestos, a brake lining fabric which today is standard in automobile brake construction.

The prime reasons for the almost instantaneous success of Multibestos are suggested by the name of the fabric. The first half of the word implies that the fabric is a multiple weave, while the last half suggests the asbestos of which it is made. By multiple weave is meant a solid weave in which every thread is tightly bound into a solid mass, it having no loose plies to break under the stresses of brake service, nor containing "stuffers," which is the trade name for layers of loose threads placed between the outer plies solely for the purpose of making the brake lining of a desired thickness.

#### Features of Multibestos.

In Multibestos the different thicknesses are obtained wholly by the number of solid weaves of the fabric, which makes an interlocking web of asbestos yarn. It was upon this feature of manufacture that the success of Multibestos was and is based and the Multiple company was the first to manufacture brake lining of this type. In 1911 its business had grown so large that a new concern, the Standard Woven Fabric Company, was incorporated to take it over and provide larger production facilities. In the four years the Standard company



T. J. Daley, Sales Manager.

has been in existence the sales of Multibestos have increased more than 1000 per cent. over the sales during the first year of operations.

At the outset the manufacture of brake lining was simply a side line; today instead of being a by-product it is the company's main business. It is interesting to observe how this change came about. In 1911 the production of Multibestos constituted five per cent. of the total business. In the following year it amounted to 11 per cent.; in 1913 it leaped to 75 per cent., and in the next fiscal period increased 10 per cent. more.

The astonishing increase in the year 1913 is accounted for by the fact that it was then that the company's two plants in Worcester were abandoned for a new and larger factory in Framingham, Mass., one that afforded 50,000 square feet of floor space and adequate facilities for quantity production. At the time of removal even the most optimistic member of the management felt that there was ample room to take care of any requirements of expansion that could reasonably be expected. This impression did not endure long, however, for early



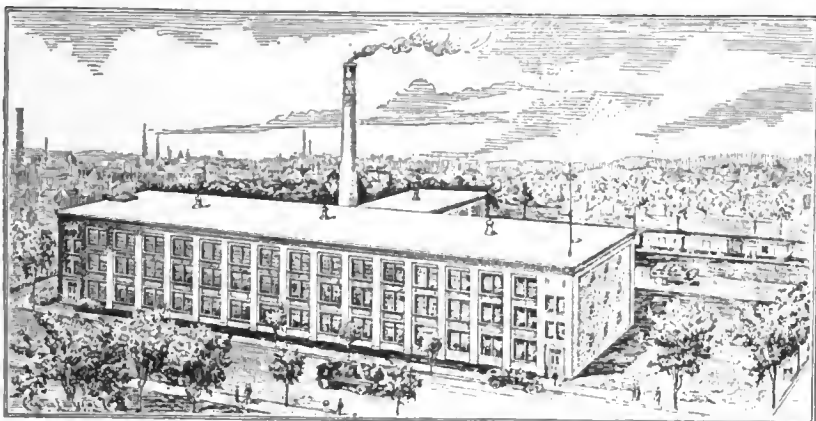
Frederick J. Gleason, General Superintendent.

In 1915 it became evident that the business was growing at a rate that made it imperative that larger quarters be obtained immediately if production was to be kept equal with demand.

#### The Plant at Walpole.

With this decision begins the third and latest chapter in the growth of the Standard Woven Fabric Company and the production of Multibestos. While considering the addition of new buildings and extensions to the Framingham plant, sufficient to triple its capacity, it was learned that in Walpole, Mass., about 15 miles away, was a highly organized and comparatively new manufacturing plant peculiarly suited to the manufacture of brake lining and mechanical rubber goods made by the Standard company. This plant, comprising 175,000 square feet of floor space and including about 75 acres of land available for future expansion, had been developed for the Walpole Tire and Rubber Company, which had ceased operations. Recognizing the opportunity the Standard company purchased the property immediately and abandoned the idea of enlarging the Framingham plant.





The Framingham, Mass., Plant of the Standard Woven Fabric Company, Which Marks the Second Step in the Development of the Manufacture of Multibestos.

One factor that influenced the purchase was that production could be started there without loss of time, which would be the result if additions were to be built at Framingham.

The negotiations were concluded Dec. 14, 1915, and without delay the company took possession and made such changes as were necessary. Under the Walpole regime the buildings had been developed into an ideal manufacturing unit; they were all comparatively new and of concrete and brick construction, the oldest being not more than five years, and they were laid out in accordance with the latest approved factory construction practice. The aggregate value of the plant and real estate was put at well over \$500,000.

Four months after acquiring the Walpole plant the production of the Multibestos had been increased to about 25,000 linear feet a day, or 7,500,000 a year. And this huge production was made at a time when only a small part of the Walpole factory had been equipped with machinery. When all the new high speed machinery and extra weaving equipment with which this plant is to be provided has been installed the output will be approximately 35,000 feet daily, or 10,000,000 annually.

#### Uses of Multibestos.

These figures well illustrate the use made of Multibestos in the automobile industry. It is standard on both high and medium pleasure cars and trucks, and is indorsed highly by repair men and garage workers throughout the country for brake linings and for clutch facings. In other lines of industry it has been adapted for use on elevators, cranes, hoists and numerous other mechanisms having frictional stop and start.

The process by which asbestos, which comes from the mine much in the same form as coal, is metamorphosed into a stiff, but yielding fabric, is a very interesting and instructive one to watch. The asbestos rock comes from Canadian mines by the car load and is crushed into a mass as fluffy as elder down under heavy steel rollers in the yarn makers' factories.

Until recently the manufacturers of Multibestos depended altogether upon the yarn manufacturers for their supplies. Since the demand for asbestos yarn has increased to such enormous proportions as it has in recent months,

there have been a number of occasions when it seemed that the company would have shut down its entire weaving department because of the failure of the yarn maker to deliver a shipment on the date promised.

#### Insuring Quality.

To offset such possibilities and to insure quality the company has installed apparatus with capacity sufficient to guarantee that a certain amount of yarn will always be on hand even though the yarn manufacturers do fail to deliver on time. Thus the makers of Multibestos are now conducting in the new Walpole plant every operation in the manufacture of brake and clutch lining.

The crushing machine, the first step in operations, is housed in a small concrete building adjacent to the larger structure in which are the carding and spinning machines. Here the asbestos rock is crushed and its fibres separated, after which it goes to the picker, an ingeniously contrived apparatus, which combs out the fibres so that they all lay in the same direction. This operation also separates the extraneous matter and dirt from the asbestos stock.

The next step is indicative of the completeness of organization of the plant.

The cleaned stock automatically passes into a small room at the rear of the picker. From here it is blown through a large galvanized tin pipe from the picker and crusher house to the second floor of the neighboring building, where the carding machines are located.

In this department, which is very spacious, there are four air tight rooms into which the asbestos stock is conveyed by blowers. Each of these compartments is situated conveniently to the carders into which the asbestos stock passes next.

#### Combing the Asbestos.

The carding machinery is standard type and is similar to that used in the cotton and woolen industries. A carding unit really consists of two machines, one of which is known as the "first carder." This machine breaks up the tangled masses of stock as it passes between cylinders on which are wire teeth of varying size and distances apart and combs it out into sheets in which the fibres all lay one way.

From this machine the asbestos goes to a finishing machine. This apparatus resembles the other, but instead of combing the fibres it twists them into slender and continuous threads. This is done by a series of rollers alternately working sideways, much after the fashion in which a person twists strings between one's fingers. This thread is automatically wound on spools.

At this stage of operations the asbestos first resembles the yarn that will ultimately be used for weaving purposes, but it is too weak to be of practical use. It must be twisted still more and be wound around a brass wire core.

From the carding department the twine is taken to the spinning room, on the ground floor of the same building, where a battery of mules twist the threads until they can be handled without breaking. In this department the mule spinners each have 468 spindles, which is a larger number than is used at this time in any industry, not excepting



The Asbestos Carding Department, This View Showing a Small Portion of the Battery of Machines by Which the Tangled Masses of Fibre Are Straightened and Twisted Into Slender Threads.



The Mule Spinning Room, Where the Yarn Is Further Twisted to Increase the Tensile Strength—These Spinning Machines Each Have 468 Spindles, Which Is the Largest Number Used in Any Industry.

cotton, silk or woolen mills.

In these departments one is aware of a cool and moist atmosphere, which is a potent reason for Multibestos quality. If one were to investigate he would find that in the engine room of the plant there is a compartment like a shower bath in which water is sprayed before a powerful fan, which forces the air into large pipes and circulates it throughout the whole factory. By this method, which is known as "washing the air," or humidifying, the atmosphere is not only kept free of impurities, but that degree of moisture which makes for the best results in spinning yarn is constantly maintained. It has been found that in humid atmosphere the yarn breaks less frequently than in dry air.

#### Incorporating Brass Cores.

At one end of the spinning department are the spooling frames, whereon the asbestos yarn is twisted around brass wire cores, which are incorporated in all Multibestos brake and clutch lining and gives that surprising strength and flexibility noticeable in the finished product. The customary make-up of this thread is three plies of asbestos yarn to two strands of wire.

Owing to the fact that at present there is not sufficient weaving equipment installed in the new Walpole plant to weave its entire output of yarn, a large part is transported to Framingham to be woven into Multibestos. However, a considerable part is woven in the new Walpole plant, and by the special weaving machinery which the company's engineers have perfected to economize one of the chief sources of large loss in weaving brake lining fabric.

In the old type of loom there are from four to 20 "spaces," that is, there are that number of pieces of brake lining being woven simultaneously. The chief objection to this type of loom is that when it is necessary to stop one "space" every other "space" on that machine must also be stopped. This means that because one piece of yarn has broken or a spool

has been emptied, production must cease on all other pieces, even though there is no "fault" in those "spaces." This has been a great source of loss in weaving, and an exceedingly vexatious problem for yarn producers.

In the new type of loom built by the Standard Woven Fabric Company, each "space" is independent of the others, which not only obviates the necessity of stopping the whole hattery of "spaces," but allows the operators to run each at much higher speed than was possible in the past. The new type of machine does not increase the number of workers, because one operator can easily take care of 12 of these new looms.

Weaving is the critical period of brake lining manufacture. Inexperienced or careless operatives can weave the fabric so loosely that it will be useless for motor vehicle uses. Consequently, the Standard Woven Fabric Company em-

ploy none but skilled operatives and places their work under the supervision of an expert weaver whose sole duty is to oversee the weaving operations. This careful inspection is carried out still further in the operations that follow.

#### Wide Variety of Sizes.

Some idea of the capacity and flexibility of output of these looms can be gathered from a study of the various dimensions of the fabric turned out. Because of the wide range of uses made of Multibestos in motor vehicles and other power driven machines, these looms are adjustable, so that the material can be woven to thicknesses of  $\frac{1}{8}$ ,  $\frac{5}{32}$ ,  $\frac{3}{16}$ ,  $\frac{1}{4}$  and  $\frac{5}{16}$  inch, and in widths varying by quarter inches from one inch to 20 inches.

This variation in thicknesses is not obtained by using "stuffers," as was pointed out before, but by increasing the number of longitudinal and transverse threads woven into the fabric in a solid mass. Variations in widths are obtained in the same manner. That is why the lining produced by this company is called Multibestos, because of the multiplicity of weaves used.

Another manufacturing economy that the makers of Multibestos use to provide for quantity production, is the method of feeding the yarn to the looms from "beams," which are huge metal spools holding a much larger quantity of yarn than can be wound on the ordinary creels. The yarn is wound from the creels onto the "beams" by special machinery.

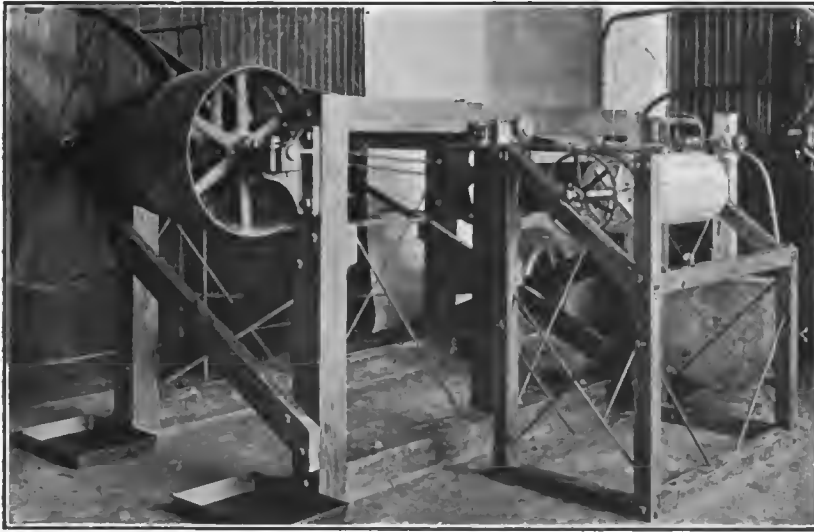
As the fabric is woven it is automatically wound on reels for convenience in handling and is then sent to the treating department, where it is immersed in a special chemical compound, which permeates every fibre and makes the fabric impervious to heat, dust, water, oil and grease. At this point the processes of making brake and clutch linings differ.

#### The Chemical Baths.

The reels of fabric are placed on revolving axles and fed into the baths, that intended for brake lining going into one



Yarn Twisters, or Spooling Frames, Where the Asbestos Yarn Is Interwoven with Brass Wires to Produce That Surprising Strength and Endurance for Which Multibestos Is Noted.



Section of Testing Department, Showing Special Apparatus by Which Brake Lining Is Subjected to the Same Conditions Obtaining in Actual Service.

bath, while that for clutch facings is fed into another, which is composed of a different combination of chemicals. Directly behind these baths is the drier, the temperature of which is maintained at a constant by a special constructed beating system. From the baths the fabric passes into the drier, which has capacity for 3000 feet at one time and about two hours is required for it to pass through on the scores of rolls on which it is revolved. When the fabric has come out it is thoroughly dried and impregnated with the compound and has had a uniform treatment.

From this department the fabric is fed through gravity elevators to the calender and stock departments on the ground floor. The calendering operation consists of compressing the fabric between steel cylinders and to simultaneously form the selvage edges and stencil the trade name of Multibestos and the white foot prints at regular intervals on the fabric. The prints are plain white lines, which run across the surface at exact intervals of one foot. They are not only distinguishing marks that identify the fabric, as Multibestos, but serve as a convenient guide for the dealer in cutting off lengths to fill orders.

From the time the raw asbestos mineral is received at the plant until the finished fabric is packed for shipment, Multibestos is constantly subjected to inspections, all of which are just as thorough as that described in connection with the weaving operations. While being fed into the treating compound the work men examine every inch of material as it unwinds before them. Others watch it just as closely as it comes from the gravity elevator into the calendar department, and the men on the calendering machines inspect it as it passes under their vision. The final inspection comes when the finished roll is passed into the stock room, the stock clerk closely examining each roll to determine that it is up to Multibestos standard. Those portions which are defective, and the proportion is exceedingly small because of the extreme care taken in every operation, are thrown on the refuse pile. Having made Multibestos a trade name for high quality, the company's officials

do not endanger this reputation by allowing any part of the product to leave the factory unless it is up to their high standards.

As the brake lining fabric leaves the calendering machine it is automatically wound on reels in 100 foot lengths. Special lengths are made as ordered. The fabric intended for clutch facings is delivered to the clutch department, where it is worked into the different shapes required for disc and cone clutches.

As a further guarantee of quality samples of fabric are periodically subjected to special tests, these reproducing the same conditions as lining would receive in actual service. The room in which the tests are carried out is very interesting, it being equipped with special scientific apparatus which was designed by the company's engineering staff.

#### Scope of Tests.

The tests are designed to determine the coefficient of friction, the pressure required to resist motion of the contacting surfaces, speed, temperature, chatter and other factors that enter into the

construction and endurance of good brake lining. One part of the apparatus is designed to determine the results of either applying brakes gradually on an automobile running at a few miles an hour up to a maximum speed or of sudden locking the brakes. The results are charted on a revolving drum and furnish a constant study by the engineers endeavoring to further perfect the quality of Multibestos.

This constant effort to improve the quality of Multibestos is a noticeable factor in the operations of the Standard Woven Fabric Company. It would seem that Multibestos had already been developed to the highest possible point of efficiency, and yet the management is always seeking to discover new processes or to evolve new machinery that will benefit the users of its brake lining.

Both the Framingham and the Walpole plants are splendid examples of this policy, they being equipped with all the latest approved devices for bettering working conditions and augmenting volume of output. All departments are closely co-ordinated and highly organized, which is a tribute to the personnel of the company's management and a reason for the great success achieved by the makers of Multibestos.

#### Personnel of the Company.

It has been said that to one man more than all others belongs the credit for the growth and prosperity of the Standard Woven Fabric Company. That man is A. H. Burdick, who has been the treasurer and general manager since the original incorporation of the company in 1911. He is a man of wide business experience and has demonstrated that he is a tireless worker. Before associating in the making of Multibestos, Mr. Burdick was at the head of the purchasing department of the General Electric Company at Schenectady, N. Y.

Another widely known and forceful member of the company's personnel is Frederick J. Gleason, who founded and for many years was the general superintendent of the Walpole Tire and Rubber



Special Apparatus by Which Asbestos Yarn Is Tested for Tensile Strength, Weight, Twists and Other Factors That Make for Good Brake Lining.

Company. In that capacity Mr. Gleason became distinguished in the rubber industry because of his original work in the compounding of rubber and the manufacture of rubber goods. In his new connection, Mr. Gleason has charge of the factory interests, a position for which he is peculiarly fitted.

The presidency of the company is held by Stoughton Bell of Boston, he being active in this capacity and also serving as the company's general counsel. The sales department is in charge of T. J. Daley and it is largely through his efforts that the company has secured numerous contracts for brake lining and clutch facing from the leading motor car manufacturers.

The foregoing paragraphs have been devoted to the production of brake and clutch linings because these are parts of a motor car in which automobile owners and operators are most interested, and because they form the greater part of the Standard company's production. The other items of the output are rubberized cotton cloth, friction and tire tapes and insulating compounds, corrugated matting and insulating varnishes, all of which have the same high degree of reputation for quality as Multibestos brake and clutch linings.

#### NEW MOTOR FOR ASSEMBLERS.

The Milwaukee Machine Tool Company has designed and is now making an engine for motor car manufacturers. It is known as the Le Rol motor and has such features as a block casting, removable cylinder head, thermo-siphon cooling, combination pump and splash lubrication, valves with mushroom type push rods and helical timing gears. The workmanship is close and of the same quality that the company puts into the machine tools which it builds for manufacturers. It is supplied without transmission or magneto.

#### CONTRACTS FOR NATIONAL COILS.

Contracts have been made by the National Coil Company of Lansing, Mich., with the Mals Motor Truck Company of Indianapolis and the Weler-Smith Truck Company of Birmingham, Mich., to supply their ignition requirements. The company was already furnishing equipment for the Reo Motor Truck Company. The "Type C" system includes a low-tension magneto with a small, neat transformer, mounted near the magneto, which supplies a high-tension current at the spark plugs. The outfit was especially designed for truck ignition purposes.

#### MOTZ TIRES FOR TRUCKS.

A large demand for Motz cushion tires for motor trucks is developing to fill a need between the pneumatic and the solid tire. F. H. Sawyer, manager of the Motz tire department of the Goodyear Tire and Rubber Company, Akron, O., states that the General Motors Company is equipping the rear wheels of 150 trucks for export with these tires and the Post-office Department recently bought 14 3/4-

ton trucks for St. Louis that were shod with Motz tires all around. Light truck operators in Chicago are getting 12,000 to 18,000 miles from Motz tires, he declares. The owner of an oil truck of 1 1/2-ton capacity on which Motz tires were renewed recently at Akron maintained that the original tires had been driven 35,000 miles.

Pneumatics are preferable for light trucks that are to make speed over good roads and solid tires for heavy, slow moving trucks. The field of the Motz tire is on trucks up to 1 1/2 tons, which will not be driven more than 25 miles an hour. They are specially preferable to pneumatics on trucks used on rough roads, or in alleys where glass and sharp refuse of any kind is encountered.

#### ARMLEDER TRUCKS.

The O. Armleder Company of Cincinnati, O., which has been making trucks and carts since 1881, has issued a new catalogue of its two and 2 1/2-ton trucks. The company makes both chain and worm drive machines, the latter in two and 3 1/2-ton sizes. They are built in a large modern factory in Cincinnati.

The chief units of the trucks are Continental motors, Brown-Lipe multiple disc clutches, Brown-Lipe selective sliding gear transmission gearsets; the differential gearsets of the chain driven trucks and the brake drums are mounted on the jackshafts; Timken front axles are employed; the equipment includes Stewart speedometers, gas headlights, Prest-O-Lite tanks, oil tail lamps and Klaxon mechanical horns.

#### GREAT GOODRICH PLANT.

Three new buildings are nearing completion at the great central plants of the B. F. Goodrich Company in Akron, O., which will make that factory the largest in the world in the rubber industry. There will be 57 buildings in the Goodrich group. It is 3.8 miles around them and to walk through all the departments would require a trip of 50 miles. There are 100 acres of floor space. The products include all sorts of tires, mechanical rubber goods, rubber clothing, rubber footwear and many other lines.

#### CRAWFORD WITH PREMIER.

Charles E. Crawford, formerly chief engineer of the Cole Motor Car Company, has become associate engineer of the Premier Motor Corporation of Indianapolis, which will make Premier cars and Mals trucks. During his connection with the Cole company he worked often with Earl G. Gunn, the new chief engineer of the Premier forces, who was with the Northway Motor Company.

#### OPENS EXPORT BRANCH.

To take care of its growing export and its eastern business, the Continental Motor Truck Company of Chicago has opened an export branch at 17 Battery place in New York City.

#### UNITED TRUCKS SELL RAPIDLY.

There has been a rapid increase in the business of the United Motor Truck Company of Grand Rapids, Mich., since the first of the year and in the opinion of General Manager George P. Sweet, 1916 is to exceed all expectations for motor truck sales.

The company began a campaign to extend its domestic business the first of the year and since that time has made contract with many dealers in all parts of the country. February showed 119 per cent. increase of business over January and the first half of March a 50 per cent. increase over February.

#### USES STANDARD TRUCK PARTS.

The Chicago Pneumatic Tool Company, which has for seven years been making Little Giant trucks, the parts of which were all manufactured in its own factory, has now adopted units produced by many well known parts makers.

These include Continental engines, Brown-Lipe transmissions, Timken-Detroit worm drive axles and Schebler carburetors. The reason given for the change is that the company discovered that the standardized parts makers turning out their product in great quantities could make parts equal in quality to those formerly used in the Little Giant truck and sell them for less than the cost of making the special parts.

In addition, the advertising of those parts has made them much sought after by purchasers and the sales department felt the pressure of inquiries concerning them.

#### GOODYEAR CORD TIRES.

One of the striking features of the recent gathering of Goodyear branch managers at the factory in Akron, was a report of the very general use of the cord tires made by the company. Many of the best known makers have adopted cord tires as standard and two out of every three manufacturers who have done so since last year are using the Goodyear. The same proportion was said to hold for the total of cord and fabric tires purchased by manufacturers.

#### FORGING COMPANIES MERGE.

The Michigan Drop Forging Company has taken over the property of the Pontiac Drop Forging Company, Pontiac, Mich. Don C. McCord is president, Lee Lynch vice president, Paul Leidy secretary and treasurer, and Robert L. Braemmann a director.

A Maxwell chassis on which a commercial body is mounted has been installed in the service of the East Boston, Mass., postoffice for mail collections and deliveries. The chassis is similar to the passenger car type.

The Splitdorf Electrical Company has opened a branch and service station at 3040 Broadway, Oakland, Cal.



**MANHATTAN MOTORS ESTABLISHMENT.**

An exceptionally fine show room has been opened by the Manhattan Motors Corporation at Broadway and 56th street, New York City, where Vim trucks are distributed to the metropolitan trade. The establishment is headed by E. F. Mitlenberger, who is well known to the public through his work with the Packard Motor Corporation. Five or more models of Vim trucks are kept constantly on display in the show rooms and sales are being pushed very aggressively. A great many machines are being placed on the streets of New York. At the formal opening of the show rooms recently the public attendance was very large.

**DAUER JOINS CHASE FORCES.**

Edward A. Dauer, formerly connected with the Packard Motor Car Company in the New England territory, on May 15 became New England division sales manager for the Chase Motor Truck Company, succeeding B. E. Blackley, who was recently made assistant general sales manager. Mr. Dauer's headquarters will be at Providence, R. I.

**RESIGN FROM ACCESSORY MAKERS.**

H. E. Raymond and C. E. Whitney resigned as members of the board of directors and of various committees at the meeting of the directors of the Motor and Accessory Manufacturers held May 5. Both expressed personal regret at retiring from activity in the association. Mr. Raymond served the association as president in 1909 and 1910; as vice president from 1904 to 1908 inclusive, and as a member of the board since 1904, in addition to being a member of a great number of committees. Mr. Whitney served as a board member during the years 1905 to 1916 inclusive, as well as being a member of important committees. W. O. Rutherford, general sales manager of the B. F. Goodrich company, was elected to serve Mr. Raymond's unexpired term on the board and executive committee. He was also appointed a member of the finance committee. Christian Girl was made a member of the show and allotment committee. The election of Mr. Whitney's successor was postponed. The Lumen Bearing Company of Buffalo, manufacturer of brass castings, renewed its membership at this meeting.

**LUMBER HAULAGE BY TRACTOR.****Detroit Concern Utilizes Machines with Wagon Trailers with Much Success.**

The possibilities for using horse equipment as trailers or semi-trailers for gasoline tractors are of much interest to those who have heavy haulage to do, and these are seemingly well demonstrated by the experience of Charles W. Kotcher, a Detroit, Mich., lumber dealer, who has a Knox four-wheel tractor in his service.

Generally the Kotcher tractor is used with a semi-trailer, which is positively controlled when coupled to the tractor, but where necessities demand large loads two ordinary horse wagons have been towed and normal freights hauled on them as well.

With reference to the special work of this machine that is shown in the accompanying illustration, the following extract from a letter by Mr. Kotcher to the E. T. Towar Company, Knox tractor agent at Detroit, is specially interesting:

In reference to the use we put the Knox tractor in our business, would say the tractor has performed in quite a remarkable manner. We have been able to haul extremely heavy loads and the ability of the truck to get around in close quarters and turn properly is a revelation.

A short time ago we unloaded a car of 1x4 white pine strips, which we moved from our lower plant to our upper plant with the Knox tractor. We had 12,000 feet of this lumber on the Knox, and two of our regular standard wagons loaded with 3500 feet each hooked on behind. This load weighed approximately 26 tons, and it was quite remarkable to see the way the tractor handled this heavy load. After she hooked on she started right away without any hesitation at all, at an average speed of seven or eight miles an hour. It would have been possible to go 12 miles very easily, but as the loads on the wagons were very heavy, I didn't deem it advisable to run over eight miles an hour.

We are handling loads from 12 to 15 tons with the tractor with as much ease as a small truck with a small load. After using the Knox tractor in this way I am more than pleased that I purchased it from you, as I think it is the right thing for handling bulky loads.



Knox Tractor, with Semi-Trailer Loaded with 12,000 Feet of Lumber, and Two Wagons, Each Carrying 3500 Feet, the Load Weighing 26 Tons.



## MILK IN 11-TON LOADS.

### Big New York Dairy Company Uses Mack Tractor and Four Semi-Trailers.

The large dairy companies operating in New York City distribute their products in practically all sections of the metropolis, and some of them handle hundreds of thousands gallons of milk of different grades and cream, both to wholesale and retail customers. The city covers so large an area that distribution cannot be made from a central depot. The milk is received at different stations that are located convenient to the railroad terminals, for some of the products are brought long distances by special trains.

Between the stations and the sub-stations large transfer vehicles are used. The loads carried are greater than could be carried by horse vehicles, and besides this there is a large saving in time. The Sheffield Farms-Slawson-Decker Company, which is one of the largest of the dairy companies, is now operating a Mack tractor and four semi-trailers in this transfer service and has found that with it a very large economy of time and labor is obtained.

Each tractor body, of the type shown in the accompanying illustration, is equipped with twin elevating jacks placed at either side of the body. Springs hold the jacks securely against the body when they are not in use. When desired the jacks are dropped and they are operated by hand to raise the body so that the tractor can be uncoupled from the fifth wheel by which it is supported on the tractor chassis.

Resting on the jacks the body can be loaded or unloaded. While the tractor is hauling one trailer between the station and a sub-station one or more of the

others can be loaded and packed with ice. When the tractor returns with the semi-trailer and its freight of empty containers, it is uncoupled and coupled to another, and is immediately started to the next sub-station to be supplied. With this system the tractor is kept in continuous use, and in the event of need can be operated 24 hours a day.

### NEW STERLING TRUCK CATALOGUE.

A handsome catalogue treating very completely every feature of design and construction of the 1500-pound, two, 3½, five and seven-ton trucks built by the Sterling Motor Truck Company of Milwaukee, Wis., has just been issued. It devotes much attention to the features of design which are used exclusively in Sterling trucks, and especially to the Sterling semi-floating worm drive rear axle.

### FIRE HORSE DISAPPEARING.

An investigation made by the Iowa state insurance department indicates a rapid decrease in the number of the fire horses in use in American cities. Two years ago in 315 American cities 7059 fire horses were in use, while one year ago there were but 5869 horses in service in 690 cities.

### HOW CITY DELIVERY HAS CHANGED.

A discussion of the changes that have come about in the delivery problem of the large city merchant is given in text and diagram in a truck folder issued by the Packard Motor Car Company.

Two million automobiles are carrying people from the city into the country and every mile of good road that is built distributes the population more widely, the circular says. Practically every city has new sub-divisions spreading out into the country. All this means that delivery routes are being constantly lengthened, while the demand for prompt service grows more insistent.

A decade ago the city merchant found all his best trade within two or three miles of his store. Then the horse and wagon were able to give him the necessary service. Today his patrons are scattered over a wide area and his delivery limits have expanded from three miles to 10 or more. Yet the capacity of horse and wagon delivery has not increased.



Mack Tractor Used with Four Semi-Trailer Bodies by the Sheffield Farms-Slawson-Decker Company to Haul 11-Ton Loads of Dairy Products in New York City.

## NILES WORM-DRIVEN TRUCKS OF TWO CAPACITIES.

**M**ARKETING machines direct from the factory or through service stations or branches in different commercial centres, the sales policy of the Niles Car and Manufacturing Company, Niles, O., which has planned manufacturing trucks on a large scale, is diametrically opposed to the method of distribution the vogue with the industry.

The statement by the company is that it will produce high-grade machines, and the plan for the present year is to build trucks of two capacities, 1500-2000 pounds and 4000-5000 pounds, which will be practically to one design. The intention is to standardize the design and as other machines of various sizes are determined these will substantially, if not literally, conform to this.

The company will build vehicles of units that are recognized as standards, developed and manufactured by specialists, and have been proven by service to have every desirable quality. The trucks will be driven by worm shaft and wheel and will reflect the most advanced automobile engineering.

The company is known throughout the nation as manufacturer of large electric trolley cars, such as are used by urban and interurban railroads for passenger service, which it has produced for 15 years. It has a very large factory at Niles, a considerable part of which will be devoted to the truck division, and which is convenient of access from both Pittsburgh and Cleveland.

### Has Special Equipment and Facilities.

The company has installed a large machine equipment and special facilities for quick and economical production, the conservation of labor and material being objects specially sought. One installation is an electrically operated transfer table, which will handle a freight car loaded with material at one time; this will be operated in conjunction with an overhead trolley system from the inbound loading platform to the storeroom and thence to every part of the machine room and assembly floor. All the material will be received and distributed through the different departments by this system. The bins and shelving of the storeroom have been scientifically arranged to obtain the greatest economy.

The machine room and assembly floor are in a building 250 feet square, well lighted and with few posts. The arrangements are such as to afford ideal working and sanitary conditions, to insure the comfort of the workers. The company will build all the bodies for its trucks and these will be to designs suited for a large number of purposes. The bodies will be produced in a structure 150 by 250 feet, two stories, in which all the machinery will be on the ground floor and the assembling, glueing and finishing will be done on the second floor. In this division every endeavor has been made to obtain high-grade and economical production.

The trucks will be to a design that will be regarded as conventional in every respect, the engine being mounted forward of a dash under a hood. The machines will be constructed of the same components throughout, including Continental engines suspended at three points, Borg & Beck multiple dry plate clutches, Covert transmission gearsets, Eisemann high-tension waterproof magneto ignition with fixed spark, Stromberg carburetors, Fedders honeycomb radiators, Blood Bros. universal joints with tubular driving shafts, Timken-David Brown rear axles and Timken front axles, heavy artillery type wood wheels, and the frames will be of heavy pressed steel angles with numerous cross members and stout gusset plates. The light chassis will be equipped with pneumatic tires and the heavy chassis with solid rubber tires, the former with demountable rims.

The production work will be standardized and a complete installation of jigs will insure high-grade workmanship and absolute interchangeability of all components entering into either vehicle. The machines will be completely equipped and will have every desirable accessory.

### Machines of High Grade.

Men of long experience and widely known in the motor truck industry have been engaged by the company to direct the operations of each department, and there is no reason why the machines produced should not be of exceedingly high grade. The company will establish and maintain service stations in all important cities, where the intention is to concentrate the sales. No agents will represent the company, which has adopted a "direct to user" policy, but a complete sales organization will be maintained direct from the factory. District sales managers will be located in all important cities, so that all the benefits from a dealers' or agents' policy of distributing will be insured to those contemplating purchasing or to those operating machines. At these service stations full stocks of parts will be established and facilities provided for their application.

The "direct to user" plan of selling, which will eliminate the middlemen and their profits, will, according to statement by the company, considerably reduce the prices of high-grade trucks as found in the prevailing market. The company has issued a booklet explaining in detail its service and selling plan, which will be mailed to prospective purchasers at request.

A freight truck line between New Haven and New York is being planned. A station is to be established at Bridgeport. Freight charges for the trip would be \$1 for each 100 pounds as compared to 22 cents on the railroad. The line would be started with five large trucks, which would be expected to make a round trip, loaded both ways, every day.

## COST OF STERLING DUMP TRUCK VERSUS HORSES.

By R. W. HUTCHINSON, JR.

**E**VERY road contractor who has 5000 yards of loose material to haul can handle this minimum amount of material more profitably in a heavy duty dump truck. The following analysis shows comparative yardage moving capacity and the equivalent cost of the motor and the animal drawn handling system, the actual saving in money and the greater tonnage delivery capacity of the motor truck method.

This analysis has been verified from the actual experience of road contractors in the states of Ohio, Indiana and West Virginia, and is in no wise a display of mathematical gymnastics to confound and conflict the horse dump truck system of handling road building materials.

### Operating Cost of 10 Horse Teams.

Consider 10 teams complete with wagons and harness as representing the equivalent investment of one seven-ton Sterling dumper—viz., \$5000. Take the case of a contractor having  $3\frac{1}{2}$  miles of water bound macadam road to build—a road 16 feet wide nine inches deep. This requires the haulage of 8213 cubic yards of crushed stone. Take the average length of haul for building this road as two miles. Consider teams as owned and teams as hired, \$4 per day per team. If the contractor owns his teams, his cost per day for operating them will be made up of the following items:

10 drivers.....	\$15.00	Interest on Investment.....	\$1.00
Feed .....	10.00	Natural depreciation....	3.50
Shoeing .....	2.50	Repairs .....	2.00

Total per diem cost of 10 teams.....\$34.00

The teams average five trips each per day, hauling an average of two yards of material per trip. Total haulage per day per team, 10 yards; for 10 teams, 100 yards. Dividing 100 yards into \$34 gives a cost of 34 cents per yard. If the teams are hired the aggregate rental cost would be \$40 per day, or 40 cents per yard.

### Operating Cost of Sterling Heavy Duty Dumper.

Considering the cost of hauling with a Sterling dumper we find this to be an average of \$17 per day, made up of the following items:

Interest on Investment.....	\$1.00	Oil .....	\$5.00
Natural depreciation....	3.50	Repairs .....	2.00
Driver .....	3.00	Tire wear .....	4.00
Gasoline .....	3.00		

Total per diem operating cost on 50 miles per day schedule.....\$17.00

For the same two-mile haul carrying five yards per load, the Sterling dumper will make two round trips per hour, hauling 100 yards in 10 hours at a cost of 17 cents per yard, or just half the cost for the same amount of material handled with teams owned and approximately 60 per cent. less than the cost with

rented teams. On a  $3\frac{1}{2}$ -mile contract, a contractor would save on handling 8213 yards with a Sterling dumper, the sum of \$1396 ( $8213 \times \$1.7 = \$1396$ ) on the basis of owning his teams. And by using a Sterling dumper he would save \$1889 ( $8213 \times \$2.3 = \$1889$ ) on the basis of hiring his teams.

The Sterling dumper would thus save over the teams that are owned by the contractor the sum of \$17 per day, and over the hired teams \$23 per day. Figuring that both systems will handle 100 yards per day as an average, it will take approximately 82 days to deliver this material if there were no lost time, which is not usually the case. One can conservatively estimate 18 days of lost time, which would require 100 days to complete the job. These 18 days would be an inactive period, but it would be necessary in either case, using a motor truck or horse teams, for the contractor to keep his organization together. Whether working or idling, the maintenance cost of the teams is the same. Consequently, 18 days of idling with team haulage costs the contractor in maintenance alone \$612 (18 days at \$34 per day).

Comparing the maintenance cost of the Sterling dumper for 18 days of idleness with the maintenance expense of horse haulage:

The only maintenance cost of the truck when idle would be the interest of the investment and the cost of the driver, amounting to \$4 per day, or \$72 for the 18 days—a difference of \$540 actual saving in favor of the truck from 18 days of enforced idleness. Adding this figured amount of \$612 to the expense to the contractor of doing his haulage with owned teams, the total amount lost is \$1936 ( $\$1396$  plus  $\$540 = \$1936$ ).

### Comparison of Saving in Time and Money.

The above conservative figures are based upon a contractor requiring 100 days to complete the contract. Even if he owns his teams he cannot haul the amount of material demanded in less than 82 days. If he owns the Sterling dumper he can do the same work in one-half the time, due to the fact that he can work nights to a greater advantage with the Sterling dumper than he can during the daylight hours, because traffic is off the highways at night and a Sterling dumper can be run at a higher average speed. Hence he can very likely save a portion of the 18 days we have estimated as lost. Contractors have advised us that with a Sterling dumper they have been able to make up from 10 to 20 per cent. of enforced idleness due to the advantages of operating a Sterling at night.

### Comparison of Cost During Inactivity.

We can conservatively figure on 100 days of inactivity of the contractor during the winter months. Consider the cost of taking care of 10 teams during the winter months—and the contractor certainly must do

this, because he cannot sell off his horses at a loss when the demand is slack and buy them again in the spring when the demand is active on a rising market. The winter cost of keeping horse teams amounts to an average of \$14.75 per day, made up of:

Interest on Investment	\$1.00	Shoeing	.....	\$1.25
Daily cost of feeding	10.00	Stabling	.....	1.00
Two hostlers	3.00			

Total upkeep per day for 10 teams.....\$14.75

#### Winter Cost of a Sterling Dumper.

Interest on investment	.....	\$1.00	per day
Garage storage	.....	.50	per day

Total.....\$1.50 per day  
Total cost of maintaining 10 teams 100 days.....\$1475.00  
Total cost of maintaining Sterling dumper 100 days.... 150.00

Total saving in maintenance of Sterling dumper....\$1325.00

#### Idle Horses Cost Heavily.

Horse teams, therefore, during the actual idle period of 100 days consume \$1325, which is approximately 25 per cent. of their investment outlay, figuring this at \$5000. Assuming the useful life of the teams to be four years, the total loss a contractor incurs from his horse haulage systems amounts to  $4 \times \$1325 = \$5300$  for merely maintaining them during the winter months. In other words, he pays the investment outlay twice as an essential insurance for keeping together his physical organization.

The bigger the contractor's operations—and necessarily the bigger the amount of his horse equipment—the bigger the proportionate loss. For example: Suppose the same contractor has two  $3\frac{1}{2}$ -mile road jobs and operates 20 teams on this basis, the loss by owning the teams on the two contracts would be twice \$1936, or \$3872. But this is not all. The contractor has an additional loss of 100 days during the winter months for the other 10 team units, or \$2650.

#### MOTOR VEHICLES IN LIQUOR BUSINESS.

With a view to interesting the motor trade in the continuance of the liquor business, figures were compiled at the convention of National Wholesale Liquor Dealers' Association, held in Louisville, Ky., May 9 and 10, to show the investment of the business in motor vehicles. It was stated that a total of \$25,000,000 had been expended for trucks and small passenger cars for salesmen, with an annual replacement cost of \$20,000,000.

#### DAIRY ECONOMY WITH KISSEL TRUCK.

The Edgewood farm at Pewaukee, Wis., uses a Kissel truck in the haulage of milk and its other products. The depot to which the farm's milk is hauled is  $2\frac{1}{2}$  miles distant and five tons of milk are taken there at each load. Four or five car loads of freight are unloaded every week. This work is handled in much faster time than is possible with horses.

The best work the teams ever did was to haul  $2\frac{1}{2}$

tons to the load and make two trips a day. The truck handles four tons and will make four trips. There is a driver and a helper on the truck. The use of the truck reduces the number of horses necessary to operate the business and makes possible the use of horses exclusively in the fields during the planting and harvesting seasons. The farm manager declares that even if the truck did not save money under the cost of horse hauling the owners would not go back to horse haulage.

#### SPEAR GOES TO GRAMM-BERNSTEIN.

R. H. Spear, who has been general manager of the Scripps-Booth Company during its rapid growth of the last two years, has been appointed sales and advertising manager of the Gramm-Bernstein Truck Company. He assumed his new duties May 15.

Mr. Spear 15 years ago was a court stenographer and later became an accountant, and then general manager of the Hygeia ice plants. He is the author of 16 books on business and business efficiency. One of these is the Commercial World Encyclopedia of Accounting, which covers 2500 business subjects. One of his books, "Scientific Auditing," was sold to about 60 per cent. of the professional auditors of the United States and Canada in six months. In one trip of 10 months' duration, Mr. Spear covered 15,000 miles and investigated more than 400 factory organizations in 28 different states. He expects to surround himself with a number of high-grade salesmen.



R. H. Spear, Sales and Advertising Manager, Gramm-Bernstein Company.

#### LANSDEN COMPANY'S NEW OFFICERS.

The Lansden Company, Inc., manufacturer of electric trucks and wagons, which has general offices at 2211 Nostrand avenue, Brooklyn, has elected the following officers: Frank S. Komp, president and treasurer; William R. Garton, vice president and general sales manager; Newton A. Burgess, secretary, and William R. Garton, sales engineer, with offices at 299 Broadway, New York City.

The Thomas B. Jeffery Company of Kenosha, Wis., will build two new additions to its plant during the summer. One of these will be a foundry designed by a firm of Chicago architects and the other a five-story factory building of steel and concrete.

# TRUCKS AND THEIR USE AS SEEN BY READERS.

## The Differentialless Truck Rear Axle and Its Engineering Possibilities.

Editor Motor Truck:

The idea of operating without a differential is not new. It has been successfully used on racing cars for a good many years, but in the commercial field it has not been used to any great extent, particularly in the heavier sizes.

The following advantage of this type of drive must be particularly interesting to truck users at this time:

- First—Positive pull on two wheels.
- Second—Greater tire mileage.
- Third—Less wear and tear.
- Fourth—Gasoline economy.
- Fifth—Dependability.
- Sixth—Simplicity.
- Seventh—Weight.
- Eighth—Price.

**Positive Pull on Two Wheels**—The positive pull on two wheels can only be appreciated by the truck user himself. Nothing is more exasperating than getting in a mud hole with one wheel only and that wheel begins to spin, while the other is on perfectly good ground. In order to get traction, chains are run around the tires, which in a good many instances only digs the hole deeper, until finally jacks and planking have to be used in order to get the truck out. If the positive drive is on both wheels the one wheel on good ground will invariably pull the truck through a very bad place and this construction absolutely prevents any spinning of the wheels when starting under load.

It is a well known fact in Europe at the present time that the conventional differential on the army service corps trucks will be a thing of the past. Some form of positive drive or locked differential will be called for on the various subsidy specifications.

We prophesy that a little cross country work in Mexico with the United States army service corps will bring about the same thing.

One has only to imagine a truck operating under shell fire and extremely muddy roads and the truck becoming mired when questions of greater mileage, less wear and tear, gasoline economy, etc., are of infinitesimal value as compared to the truck getting from one place to another positively, but when the greater tire mileage, wear and tear and gasoline economy are even questionable, one really cannot see any serious objection to cutting out the differential.

The conditions with the average business man are just as vital and important and almost analogous to trucks operating under war conditions.

**Greater Tire Mileage**—Quite a few of our best racing cars have been equipped with solid rear axle, the claim being made that the action of the spinning of the wheel when in the air is very much more detrimental to the tires than the little slippage on rounding a corner on the race track. Similar conditions exist when running a solid tire on heavy truck service over rough cobble stones. Any close observer driving behind a truck

under these conditions will invariably be able to see under the tires without any difficulty whatever. At the moment these wheels are in the air they must of necessity accelerate and come down on the road at a different speed from which they left, grinding off the rubber to a much greater extent than when rounding corners with a blank differential where the slippage is uniformly distributed throughout the entire periphery of the tire.

In truck service, with the limited experience we have had with the blank differential as compared to any other, it is noticeable that the temperature rise in the tires is very much less when rounding corners under severe loadings with the solid axle than the spinning action of the wheel in a mud hole with the regular differential.

The tire wear, of course, is largely a question of heat units. It is quite a common sight to see a heavy truck in difficulties with the tires smoking from the spinning action of the wheel on soft ground.

Mr. Green of the Fifth Avenue Coach Company has been working jointly with the Sheldon Axle Company for a considerable time with the idea in view of dispensing with the differential. Up to the time of writing these buses have not made sufficient average mileage to warrant our forming any definite opinion, but one bus has to its credit over 15,000 miles on one set of rears, while the average tire mileage is considerably below this.

Mr. Charles P. Ward of the Ward Electric Vehicle Company has also been experimenting along the same lines, and has found in taking a city block—eight blocks to the mile—continuously under load, the difference in the battery consumption cannot be noted when using the differential or without. The tire wear, of course, is in direct proportion to the amount of energy consumed in spinning the wheels under adverse conditions, and this can be very accurately calibrated on an electric vehicle.

**Less Wear and Tear**—There is certainly less wear and tear with the blank differential on engine and all running gear when one wheel partially leaves the ground, due to the irregularities of the road as aforementioned.

This variance is felt throughout the whole chassis, from the engine clear back to the rear axle, and in a good many instances sets up a frightful vibration, and makes it most disagreeable to negotiate cobblestone roads, particularly when light in the rear. The results obtained from the blank differential as compared to the regular one in this respect are most pronounced. Riding on a truck with a solid differential the load is rarely taken off both wheels at once. When one wheel leaves the ground the full torque is absorbed in the other wheel remaining on the ground, holding the engine down and preventing racing to a very, very marked extent.

The regular differential reminds one

of a steamer. Every time the propeller lifts out of the water the engine races and sets up such a vibration that in a good many instances you wonder whether the ship is going to hold together or not. Imagine what a call there would be by marine constructors for something which would absolutely prevent the propeller shaft racing. This is certainly analogous to the truck situation at the present time with the exception that the motor truck can now prevent racing, with its attendant wear and tear on all the parts affected by eliminating the differential.

**Gasoline Economy**—Every time the propeller leaves the water on a steamer and beats the air, it is just like throwing so much coal overboard. The wheel need not leave the ground actually, but the pressure be relieved to such an extent due to the oscillation of the spring over irregular road surfaces that the wheel begins to spin and the tractive effort instead of being used for the propulsion of the truck, simply using the gasoline for no purpose. This is quite pronounced on heavy vehicles where the wide track is used. One wheel is tracking on good ground all the time, while the other is slipping in soft mud. There is not a single truck designer of repute who has not been in serious difficulties at some time or other under these conditions. The writer is well aware that the tractive resistance might be double, due to the condition of the road surfaces, but on top of this, the loss due to the spinning differential is certainly quite pronounced.

Under the above conditions it is common for engineers to consider the radiator too small—the engine not large enough—or the gear reduction wrong, when in a good many instances the differential is directly responsible, operating on extremely muddy roads with a very heavy gasoline consumption at the best and sooner or later a solid axle will be called for more extensively on account of gasoline economy, if nothing else.

**Dependability**—With the elimination of the differential, broken gears, differential spiders freezing fast, broken cases, etc., are a thing of the past, but one has to be extremely careful with the size of drive shafts, as this doubles the stress in these members and must be amply taken care of. The particular advantage of using the Sheldon semi-floating axles under these extreme conditions lies in the fact that the outer ends must of necessity be made very liberal in size, due to the combined bending and torsion, and it is a comparatively easy matter to increase the inner ends of the drive shafts. If this is done there is absolutely no question of broken drive shafts and the whole axle becomes thoroughly dependable.

**Simplicity**—Cutting out the differential ring gear and pinions with the spiders has reduced this design to its simplest possible form. Every one of these parts are going to wear with their attendant backlash.



The elimination of backlash alone is almost sufficient justification for the design, but the simplicity of the construction will appeal to every one.

**Weight**—One of the objections at the present time to the live axle type of drive is the unsprung weight at the centre of the housing. This, of course, is in the worst possible place and the more the centre can be lightened the sections throughout the axle can be considerably reduced.

There is also a distinct gain in the oil capacity as compared to the full type of differential. The outside dimension of the axle housing remains the same. The space taken in the ordinary construction with gears will allow of that much more oil being carried, which is a consideration when operating under severe conditions.

**Price**—It is evident at a glance to the layman that there is considerable reduction in price to be made in this construction over any form of drive known at the present time, and we prophesy that this alone will give it the increased popularity it richly deserves.

Summarizing, after considering all the various points, it is well not to become too enthusiastic, as the introduction of a blank differential on the face of it is so drastic that one must of necessity move with extreme caution. The time taken in rounding a corner is only a fraction of one per cent. of the straightaway running, and if a truck is continuously operating around a city block (eight blocks to a mile), it figures around four to five per cent. of the straightaway time, but with average wheelbase and track, and good strong drive shafts, the positive pull on two wheels, greater tire mileage, less wear and tear, gasoline economy, and the extreme dependability with simplicity, weight and price in its favor, we prophesy quite a following of the blank differential.

Yours very truly,

SHELDON AXLE AND SPRING CO.

Arthur M. Laycock,

Chief Engineer.

#### Advantage of the Internal Gear Over Worm Gear Truck Axles.

Editor Motor Truck:

Continual service at lowest cost is the goal which all designers of high-grade motor trucks aim to attain, and it is owing to this standard that the chain driven vehicle, although the least expensive drive manufactured, has been in the last few years superseded by other types.

Next to the engine the rear axle is the most important unit of a truck, in fact it is most essential to have a good rear axle with the greatest safety factor of strength, most efficient speed reduction and greatest durability.

**Strength.** The internal gear axle is invariably a drop forged heat treated I beam, the strongest construction known to engineering science, which it is practically impossible to employ in the construction of a worm drive. No mechanism is carried in the axle proper, the jackshaft being located in the rear of the

axle, consequently there are no stresses due to the load transmitted to the driving mechanism to impair its efficiency. The logical functions of axle and jackshaft are to carry load and transmit propelling power respectively, which ideal is realized by the internal gear axle. A worm drive axle is built up of steel castings, the strength of which is a rather uncertain quantity, and in order to get any degree of safety factor it is necessary to use a greater mass of metal in the axle than is good for the carrying capacity of the tire. A complete one-ton internal drive axle weighs about 365 pounds, against about 580 pounds for the worm drive axle; two-ton axle, 600 pounds, against 1100 pounds; three-ton axle, 800 pounds, against 1400 pounds. If this extra weight of the worm axle meant more strength it would not be so serious, but this extra weight represents only waste of natural resources. If a two-ton internal gear axle carried 500 pounds ballast of stones it would still be a stronger axle than a worm axle of equal capacity.

**Efficiency.** The reduction of the speed of the engine between the drive shaft and the wheel is important, as the better the mechanism the more power will be delivered at the road wheels. The action of the internal gear is a rolling contact, very efficient, as there is no loss of power due to friction; moreover, it is very quiet because several teeth are constantly in mesh, the same as in an external helical gear. The ring gear and pinion are machine cut out of drop forgings made from the best nickel steel obtainable, and the finished gears are heat treated to 80 scleroscope. The whole mechanism is enclosed so as to be oil tight and packed with grease. Any kind of grease will do for this type of axle, and if through carelessness or accident the gear should run dry temporarily, nothing serious would happen. The action of worm and gear is a sliding contact, the friction of which produces a high degree of heat, so that it is necessary to allow considerable play between the thrust bearings of the worm shaft in order to compensate for the heat expansion of the shaft. A spur gear can run dry for a time, but to run a worm gear dry for a minute would be fatal to the gear. It is highly desirable to use the best lubricant for a worm axle and it costs about \$2.50 to fill a three-ton axle once with Witmore's gear compound, whilst an internal gear axle can be lubricated at a cost of \$0.57. The internal axle is the more efficient axle because it has a quiet, cool running mechanism, and no power is wasted on generating heat through friction. Economy and efficiency are inseparable. Figuring gasoline at 15 cents and including all expenses, such as depreciation, insurance, wages, etc., a two-ton truck running 100 miles per day costs \$.064 a ton mile. At this rate a worm drive axle being 500 pounds heavier than an internal gear axle will increase the operating expense of the truck \$480 per year.

**Durability.** The internal gear as made in a modern axle construction is practically indestructible. The rolling action of the gear teeth produces hardly any

wear, as both gear and pinion being hard, it is impossible for any grit to embed itself. In a worm axle the sliding action not only generates heat, but also causes wear. If any grit finds its way into the housing it will embed itself into the soft worm wheel and accelerate this wear. The road clearance of the internal gear axle is two or three inches better than that of the worm axle and consequently there is less chance of having the axle damaged or of getting stalled on a rutty road.

**Brakes.** There are two sets of brakes to a chassis, a service brake operated by foot and an emergency brake operated by hand. A service brake is used under all ordinary conditions and though powerful enough to hold the truck, its action should be a gradual retarding of the speed of the vehicle. The internal gear axle is fitted with an expanding service brake inside a 16-inch drum. The emergency brake should be absolutely reliable, a brake that will positively stop the truck under all conditions, at all speeds and on all grades. So powerful a brake can only be located on the drive shaft, where its power is multiplied by the ratio of the gear. The emergency brake on the illustration is equal to a 76-inch diameter brake on a wheel. A brake of this power can safely be fitted only to an internal gear axle, as on a worm drive axle the pressure produced will break up the film of oil so vital to the worm and wheel.

THE H. G. BURFORD COMPANY.

H. G. Burford, President.

Mr. Burford is a member of the Institute of Mechanical Engineers and the Institute of Automobile Engineers of England, and is a member of the council of the last named organization.—Ed.

#### Wants Belgian Agency for Low-Priced Truck After the War.

Editor Motor Truck:

Having read frequently your interesting journal, I am permitting myself to take advantage of your willingness to oblige and of your knowledge.

I wish to represent after the war in Belgium a line of American automobiles. Can you give me the names and addresses of commercial car makers which will meet the following conditions:

Sturdy vehicles that will be capable of giving service on our bad Belgian roads, which are practically torn up. The weight carried should be about 300 or 500 kilograms with the driver. The price must be from \$400 to \$600 as a maximum. In economy the car which I describe should be like the Ford. I wish to connect preferably with a firm that specializes on that sort of a vehicle. It should be able to serve bakers, butchers, tailors, delicatessen shops, etc.

Please do not write me of any firm except those that may be seriously considered.

I hope that you will give me a reply and waiting your reply I am very truly yours,

MAURICE POUPPEZ,

13, Castle Hill Avenue,

Folkestone, England.

## REFORESTRY BY MOTOR TRUCK.

### Removal of Large Trees Long Distances Now a Practical Work.

Reforestation has been generally undertaken by owners of large estates and by directors of municipal and state works in a very limited manner because of the difficulty of removing trees of considerable size from the places of propagation.

The reasons for this are that even comparatively small trees could not be removed, even short distances, with reasonable certainty of their surviving transplanting, because but a very small area of the roots could be preserved, very little of the soil in

of 49 miles and over roads that are extremely bad. The size of the tree precluded haulage by railroad, and animal wagons were out of the question.

A White five-ton truck was decided on for the work. A ditch was dug about the tree and the roots cut carefully. Then with levers the tree and a great disc of earth was lifted and blocked. The earth disc was bound with burlap and rope and by the use of skids the tree and its base, which weighed approximately 10,500 pounds, was moved on to the platform of the truck. The tree itself was estimated to weigh a ton.

Supported by rope guys, the tree was carried upright on the truck, the route being chosen so that during the run there should be no overhead obstruction met. The work was accomplished in a single day and the tree transplanted in a pit on the estate, where it is now seemingly flourishing.

### TWO VELIE WORM DRIVE MODELS.

Two new worm drive models of Velie trucks have been perfected and are being marketed by the Velie Motor Vehicle Company of Moline, Ill. The new models are rated at  $1\frac{1}{2}$  to two tons and  $3\frac{1}{2}$  tons. The design is similar in both except as to size. The motors are  $4\frac{1}{8}$ -inch bore and  $5\frac{1}{4}$ -inch stroke and  $4\frac{1}{2}$ -inch bore and  $5\frac{1}{2}$ -inch stroke, and are made by the Continental Motor Company. They are controlled positively by gear driven centrifugal governors. The radiator tubes are removable and the whole radiator assembly is mounted on springs to absorb the shocks. Later in the summer an additional model is to be built.

### SPECIAL AGENT'S EXAMINATION.

Examinations for the position of special agent of the Bureau of Foreign and Domestic Commerce to investigate markets for motor vehicles in South America was held in various parts of the country May 19. The examination was divided into three parts. One was designed to show the candidates' knowledge of investigation and methods of investigation, one was devoted to the Spanish and Portuguese languages, and one a statement of the candidates' education and experience.

### NONES HEADS NORMA COMPANY.

W. M. Nones, who has been secretary-treasurer, as well as general manager of the Norma Company of America, was elected to the presidency at the recent annual meeting of the company. He retains the office of treasurer and will continue to direct the general management of the concern, which in five years has been developed from a small importing business to a commanding position among the American manufacturers of ball, thrust, roller and combination bearings.



White Five-Ton Truck on Which an Oak Tree, 40 Feet High, 13 Inches Diameter, Weighing 10,500 Pounds, Was Transported 49 Miles Over Very Bad Roads.

which they were grown could be taken with them, and the cost of transportation has been almost prohibitive.

What was a remarkable operation because of the size of the tree and the distance it was transported recently took place when an oak, 40 feet high and 13 inches diameter, was removed from the nursery of Stedman Bent at Chestnut Hill, near Philadelphia, Penn., to the estate of Eugene Du Pont at Greenville, Del.

Mr. Du Pont is improving a large property and desired a tree of proportions that would undoubtedly add to the beauty of the property rather than await the growth of a seedling. Mr. Bent undertook to remove a tree from his nursery to the estate, a distance

## AMERICAN ARMORED TRUCKS FOR ARMY SERVICE.

FROM the time that motor trucks were regarded as even possible for road haulage the expert engineers of the European nations, especially Germany and France, made careful study of them from observation of commercial and industrial service and trials in army manoeuvres to determine what types would be best suited for practical use in the field. Conclusions were reached and designs decided upon, and subvention plans were adopted to insure to the governments a sufficient number of machines in the event of war, but despite the preparation of a number of years, when the actual conflict came the number of vehicles available were so few as to be almost pitiful when the carefully developed resources of all other departments were reflected upon.

America, although its motor truck industry was called upon to provide many thousand machines for England, France, Russia, Italy and some of the other nations in smaller numbers, had made no preparation whatever so far as truck equipment was concerned, and not until within a year had an armored truck been built in this country for the use of the national army or the militia. A considerable proportion of the trucks sent abroad were armored and used for attack, defense and for every form of service, some of this work being done in Europe after the machines had been received, and in some instances in this country by the truck manufacturers.

When the encampment of patriotic Americans at Plattsburg, N. Y., was organized last summer the International Motor Company of New York placed at the disposal of the Federal officers in charge of the camp several trucks which were equipped in a manner which appeared to the engineers of the company as meeting in some measure the requirements for such service. The trucks were utilized for many purposes, and were found to be so satisfactory that the company engineers began to study the possibilities of building machines specially adapted for army use.

This investigation served an exceptionally good purpose when armored truck construction was taken up, because of the determination of E. H. Gary, Henry C. Frick, R. M. Thompson, D. Olcott, G. N. Wallace and H. G. Montgomery to contribute the equipment for an armored battery to the New York National Guard. These men furnished the fund, which is stated to approximate \$100,000, because of their belief that the state ought to have available the armed and

protected vehicles that European war experience has taught are absolutely necessary in the event that national defence is demanded.

### Battery of 40 Machines.

This battery will consist of approximately 40 chassis, which will be used as battle cars, aero defence cars (both types of which will be armed, the former with machine guns and the latter with long range, high elevating guns for attacking aircraft), repair shops, tanks for transporting fuel, oil and water; all manner of auxiliary vehicles and motorcycles for patrol and dispatch work. This is to be manned by a company already formed that has been organized with the purpose of affording service similar to that of the batteries now engaged in European warfare.

The first unit of the battery equipment to be com-



Mack Two-Ton Chassis with Armored Body, the First Unit of a 40-Vehicle Battery Provided for the New York National Guard by Patriotic Citizens.

pleted was that on a Mack two-ton chassis, an illustration of which is shown. The chassis to be used are Mack, Jeffery, Riker and White, which have been found extremely serviceable and dependable in service abroad and in the encampments in this country. The bodies, however, are to be built especially by the International Motor Company. Its engineering staff designed the body shown on the Mack chassis, which is maintained to very fully meet all requirements for military service. Thus far about a dozen of the chassis have been fitted with bodies, but upwards of 75 of the motorcycles are ready for use. The battery will be commanded by Captain Harry C. Montgomery, who has been very largely instrumental in its organization.

### The Importance of Army Equipment.

While this battery is controlled by New York state, a very much larger degree of importance attaches to the equipment that shall be used by the United States army. When the expedition of the army into Mexico was ordered, but very few motor

trucks were in the service, and these were utilized by the signal corps and the quartermaster-general's department, the former for constructing and maintaining the lines for communication between operating units, and the latter for transportation.

The absence of railroads and the necessity of following the different bands of raiders, generally through trackless desert and over paths and trails but little frequented, impelled the purchase of trucks from different manufacturers, which were manned by civilians temporarily enlisted, and hurried by special trains to the border, where they were assigned to the different camps where the troops were preparing for the expeditions. As these vehicles were used principally for transporting supplies, they were not fitted with special equipment for offence, and one or two of each train was armed with ordinary machine guns for protection against attack.

#### **Industry Awakened to Need.**

The situation developed by the Mexican expeditionary forces needing rapid transport equipment was a striking lesson to the War Department of the need of preparedness, even on a very small scale, and it also brought to the attention of the manufacturers of the industry the absolute necessity of the department adopting a standard type of truck that could be requisitioned by the government should occasion arise, and to have sufficient equipment and facilities for operating and maintaining such machines as would be required for the service. The general recognition of this need throughout the industry was the reason for a meeting of the foremost experts of the country on motor vehicle design during the week of May 8 at the rooms of the Society of Automobile Engineers in New York City.

The primary purpose of the meeting was consideration of the revision of the standard specifications for 1½-ton trucks for United States army service. At the different sessions design, quality of materials, interchangeability of parts, load capacity, engine capacity, road speed, location of control levers, ground clearance, suspension, electrical equipment and many other subjects received careful consideration. One of the sessions was addressed by Lieutenant-Colonel Chauncey B. Baker of the quartermaster's corps, U. S. A., and William M. Britton, electrical and mechanical engineer of the War Department.

#### **The Expert Designers Present.**

Henry Souther, past president of the S. A. E., and now consulting engineer of the United States Signal Corps, presided at the meeting, with the following in attendance: H. W. Alden, chief engineer of the Timken-Detroit Axle Company, Detroit, Mich.; Joseph A. Anglada, consulting engineer, New York City; B. B. Bachman, engineer, Autocar Company, Ardmore, Penn.; P. J. F. Batenburg, chief engineer, Four Wheel Drive Auto Company, Clintonville, Wis.; A. Ludlow Clayden, chairman, Standards Committee, S. A. E.; Chester E. Clemens, mechanical engineer, Perfection Spring Company, Cleveland, O.; H. D. Church, chief

truck engineer, Packard Motor Car Company, Detroit, Mich.; Coker F. Clarkson, general manager, S. A. E.; Howard E. Coffin, chairman, Naval Consulting Board Preparedness Committee; Herbert Chase, chief engineer, Automobile Club of America; D. L. Gallup, professor gas engineering, Polytechnic Institute, Worcester, Mass.; Lewis P. Kalb, chief engineer, Kelly-Springfield Motor Truck Company, Springfield, O.; J. A. Kraus, chief engineer, Garford Motor Truck Company, Lima, O.; Robert McA. Lloyd, consulting engineer, New York City; A. F. Masury, chief engineer, International Motor Company, New York; W. T. Norton, chief engineer, Seiden Motor Vehicle Company, Rochester, N. Y.; H. W. Perry, secretary truck committee, National Automobile Chamber of Commerce; Alfred Reeves, general manager National Automobile Chamber of Commerce; A. L. Riker, vice president and chief engineer Locomobile Company of America, Bridgeport, Conn.; C. B. Rose, chief engineer, Velie Motor Vehicle Company, Moline, Ill.; Arthur J. Slade, consulting engineer, New York City; G. W. Smith, chief engineer, Thomas B. Jeffery Company, Kenosha, Wis.; W. R. Strickland, chief engineer, Peerless Motor Car Company, Cleveland, O.; F. A. Whitten, chief engineer, General Motors Truck Company, Pontiac, Mich.; John Younger, chief truck engineer, Pierce-Arrow Motor Car Company.

#### **S. A. E. to Have Military Standards.**

The meeting marks the beginning of the establishment of a comprehensive list of S. A. E. military standards. The first task will be to formulate the fundamental requirements for the service. This will be done very carefully. The very hard conditions under which trucks operate at the front require extended study in themselves. The different divisions of the Standards Committee of the Society of Automobile Engineers will be assigned subjects by the society council.

President Huff suggested that in addition to the work of formulating ultimate standards the society should designate an exigent committee to give all possible advice on the specifications submitted to it. Accordingly a committee was appointed to take up with government officials detailed points pertinent to the design of 1½-ton trucks. This committee has already held one long session. The body consists of Coker F. Clarkson, B. B. Bachman, H. D. Church, L. P. Kalb, William T. Norton, Jr., A. L. Riker, C. B. Rose, John Younger, G. W. Smith, W. R. Strickland and A. Ludlow Clayden.

Another session was held later in the month to take up points that had been discussed by the members through the mails, together with a special report of the springs division and of the electrical equipment division of the society.

The endeavor of the S. A. E. will be to harmonize as far as possible the requirements of commercial and military service to facilitate the production and operation of motor trucks intended for very severe service.

# The MOTOR TRUCK

*Devoted to Motor Driven Business  
Vehicles of all Classes*

Pawtucket, R.I.

Vol. VII. No. 6.

JUNE, 1916.

## TRUCK ECONOMY BUILDS CONTRACT HAULAGE

**Ames Transfer Company, New York City, After Years' Experience, Gradually Disposes of Mule Teams and Standardizes Its Equipment with 25 Pierce-Arrow Machines—  
A Business Expansion Possible with Highly Efficient Facilities.**

CONVERSION of transportation equipment from animal drawn to motor driven is always a problem of first magnitude, even with those who from experience ought to know the limitations of the former type of vehicles and the very large possibilities of the latter. Considering a typical instance—the owner believes that he is operating his equipment economically, and assumes that it is thoroughly efficient, measuring it by his standard, which generally is the expense that has obtained with animals.

He has with the operation of horse equipment followed custom. That is to say, he imitated methods of others with no reason for such imitation, unless it were the assumption that those whom he imitated had determined from experience and observation that their system, from every angle of view, afforded every quality of service that could be demanded, and at cost that could compare favorably with the transportation expense of others.

There is no reason for assuming that custom establishes anything more than the channel of least resistance, just as the human being or the lower animals seek paths amid obstacles—more by instinct than by principle, rule or plan. In this respect the method adopted is without efficiency until endeavor is made to economize in time or labor, and the result is usually proportionate to the study and supervision given, which naturally develop organization and system.

### Should Be No Difference in Economies.

One can understand that with equal attention given to economies of time and labor, the actual ad-

vantages of motor equipment as compared with animal drawn vehicles are greater load capacity and superior speed, against which must be placed increased initial cost and operating expense. There is no reason why there should be difference in loading or unloading facilities, or in administration or supervision. That there are great differences



The Loading Pocket of the Ames Transfer Company at the Interborough Dock, 221st Street and Harlem River, New York City, Showing Stationary Derrick for Unloading Boats.



one must admit, and only in extremely rare instances will one find even accurate knowledge of operating conditions, to say nothing of the possibilities obtaining from careful accounting.

Conversion of transportation equipment is almost invariably regarded by the operator as being uncertain and experimental, the supposition being that lack of knowledge is an obstacle to success that cannot be removed. The man who will not hesitate to make large investment to better his manufacturing facilities, for instance, will generally delay improving his transportation equipment for no other reason than that he does not know what his expense for service is and he does not know that he can operate motor vehicles as economically as he can what he is then operating.

#### **Will Study Production but Not Haulage.**

To improve manufacturing, to illustrate, he studies the possibilities of what he believes will afford greater or more economical production, and having determined the cost and contrasted this with the probable

economies and the wisdom of making the change.

There is not in the country a more interesting business than that conducted by the Ames Transfer Company, at Kingsbridge avenue and 236th street, New York City, which is operating as a stevedore and haulage contractor, and which had when this survey was made, 22 five-ton Pierce-Arrow trucks in service and three additional machines ordered, so that its equipment is today probably the largest of any concern doing a similar class of work. Beyond this the company has standardized its equipment and this simplifies its facilities and economizes maintenance and upkeep. The company has never sold a truck and it now has all the machines it has bought, its experience extending over five years.

The company is engaged in providing haulage in any form for those who do not operate their own services or who have needs for additional units, and it is prepared to undertake any work, from a single trip or load up to practically unlimited tonnage. It has con-



**Pierce-Arrow Five-Ton Trucks, Equipped with Power Hoisting Bodies in Front of the Storage Sheds at the Ames Transfer Company's Yard at 236th Street and Kingsbridge Avenue, New York City.**

saving, he can reach a conclusion as to what is reasonably practical. But the decision is based on actual knowledge. As to transportation, he may not have had a very clear idea of the actual expense, and instead of determining possibilities, he seeks to obtain from others some of the information he ought to have available from his own accounting.

But while there may be some reason for neglect of what may be looked upon as incidental expense by those who require transportation, there can be no justification of ignorance by those who are engaged in haulage other than failure to have the character of administration, system and method that would afford the greatest measure of economy. Yet there are thousands in business specializing transporting who are operating with animals who have neither made the careful investigation that the possibilities with motor vehicles would seemingly impel, nor profited by the example of those who have converted their equipment after thorough and careful experiment has proven the

tracts, of course, which are for differing periods or works, but one may state with truth that it is dependent upon whatever engagement may be obtained rather than upon continuous work for any one or several concerns. The reason for this statement is that with rare exceptions the haulage contractor engages his equipment for work that he is practically certain of, and he can establish better prices when he can depend upon constant service. Few there are who will make investment without assurance of working their equipment continuously, unless in the event that they can obtain contracts at such prices that these will justify purchasing trucks and tractors for this work alone, expecting to dispose of them when the work is completed for whatever can be obtained.

#### **Is a Contractor and Dealer.**

"Stevedore" is literally applied to those engaged in loading and unloading vessels, but it has been more broadly applied to those who do haulage of any kind to and from piers and railroad terminals and ware-

houses or places of storage. The Ames Transfer Company is a stevedore in the sense that it has to do with unloading scows, canal boats and lighters that are used for freighting material of all kinds, and it is a contractor in the sense that it deals in some classes of building materials and engages in haulage of all kinds. The name of the company is not indicative of the work that it does, but this is from the fact that it has been developed from a suburban express or transfer company, which was established more than 30 years ago, before the creation of Greater New York, and when Kingsbridge was one of the numerous villages north of the Harlem river and was not then included in the metropolis of America.

The Ames Transfer Company is owned by J. M. and C. B. Ames, whose father bought an express business that was operated between Kingsbridge and different points in New York City, 27 years ago. The business at that time was done with a single one-horse wagon and it was largely haulage from New York to

years, but the work was of such character and the losses were such that a change of animals was made, the horses being disposed of and being replaced by mules. The mules were found to be more satisfactory for the work, and the number was increased until about 100 were in use.

#### Leased Dock on Harlem River.

The full development of the business seemingly had been reached in 1911, at which time a contract was in existence with the Interborough Street Railroad Company for use of a pier at 221st street and the Harlem river, where boats, scows and lighters were unloaded, because of the limitations of the animals. There is between Jan. 1 and March 1 to March 15 of each year a general cessation of building operations and out-of-doors construction, when the ground is generally frozen and the temperature is too cold or stormy for satisfactory work. During this period the animals must be fed and given practically the same care and attention as when they are working regu-



The Equipment of the Ames Transfer Company, the First of Which Was Placed in Service in 1911, and is Now Standardized on Pierce-Arrow Trucks, Some of the Fleet Being Worked and Garaged Long Distances from the Yard.

Kingsbridge and distribution through the village, and with such other incidental work as could be taken.

#### Business Developed from Expressing.

The name given the company served to identify it and characterized its business, which was all that was desired, and it did not differ in its activities from hundreds of others operated in New York and vicinity. But it had its business limitations and necessities impelled early morning starts and late evening deliveries, so that after an experience that seemingly proved the futility of material development, Mr. Ames turned to doing contract haulage and sought to establish relations with builders and contractors engaged in building and public improvements.

This promised more with fewer hours of labor, and Mr. Ames found a demand for service that justified expansion, he purchasing horse, wagons and carts as the work was obtained and from year to year the equipment was increased until the business was much more than local. Horses were used for a number of

largely and the maintenance cost is not much reduced.

The experience with horses was that the cessation from regular work caused a condition that was of considerable moment, for despite exercise and care for a time after work was resumed in the spring they were susceptible to the chafing of the harness and a period of "hardening" was necessary before they could be used to capacity. Horses required almost as much feed when idle as when worked and there was practically no difference in maintenance expense, although not productive.

#### Why the Mule "Beat" the Horse."

With mules a different condition obtained. They would eat different food when not worked and they recuperated after a winter in much less time and with less need of the "hardening" required for the horses. They were equal or better for the work and as a whole were more economical animals. Mr. Ames had considered seriously purchasing a farm within a reasonable distance from New York to which to send his

mules near the end of each year and keep them until they were required in the spring, believing that better results could be obtained from the animals if they were allowed to "run" than keeping them in the barns and exercising them for the period of inactivity. He was willing to make the investment because of the better work that could be obtained from the mules for about a month at most in the spring, although humanitarian considerations were of decided weight.

Mules were the sole motive power of the Ames Transfer Company until 1911. For a considerable length of time Mr. Ames and his two sons, who succeeded to full control of the business at Mr. Ames' death about two years ago, considered motor trucks in the place of animal equipment. Economies had not been neglected in any sense. A considerable number of the horse wagons and carts were equipped with manually operated hoists, and extreme care had been

and, of course, owners are not willing to sell and demand large prices for short term leases.

Reference to the low location of the site at 236th street is made because all haulage from the yard must be made on ascending grades, which means that haulage actually costs more in time of animals and in consumption of fuel and lubricants than if the streets were level or descending. From the yard to the Interborough dock at 221st street is rather more than a mile, and the dock is on the Manhattan side of the Harlem river, which much be crossed by the bridge at 221st street, and descent made from the street to the water front. This necessitates the haulage of all the loads from the dock to the street level up a short, heavy grade, and from this point there is a series of long ascents to reach the main thoroughfares south on Manhattan Island, but in the Bronx, in which Kingsbridge is located, the streets are more or less

ascending as they go north and east, except in that section that is close to the shore. The streets of Manhattan are very largely paved with stone block and asphalt, but those of the Bronx are generally macadam. As a rule they are in reasonable condition and are sufficiently wide, so that there is comparatively no congestion that would delay traffic.

#### **All Kinds of Haulage Undertaken.**

Every kind of haulage is engaged in. The company deals in some classes of building material, such as sand, gravel, crushed stone and brick, and all of these are received at the 221st street dock. When these were first handled the work was comparatively slow, because everything must be lifted from the scows and boats, which are towed from dif-

ferent points along the Hudson river to the deck of the dock and loaded into the vehicles.

Economical handling was a very important factor, and despite the cost of a pier with such equipment as the Interborough, which has a stationary derrick and a locomotive crane that is operated on tracks extended along the frontage of the dock, this was believed to be a better investment than to use what was not as well equipped. Incidentally were the yard of the Ames company at a dock a considerable operating cost could be obviated.

The purchase of motor trucks was seriously considered for several years prior to 1911. The mules were a decided economy as compared with horses and increasing the number in service meant additional expenditure for stables and other equipment. The business was increasing and the haulage distances extending and there were, of course, limitations to the distances from the yard the animals could be worked,



**The Locomotive Crane for Unloading the Boats and Loading the Trucks of the Ames Transfer Company at the Interborough Dock.**

taken to expedite loading and unloading. A part of the haulage was done from the Interborough dock on the Harlem river, but while loading could be governed there conditions for delivery elsewhere could not be improved.

#### **Why the Location in a Suburb.**

The yard of the Ames Transfer Company is located on very low land, and is on either side of Kingsbridge avenue. The site was selected when the business was small and was practically all "transfer," and with the growth additional land was bought. There was not at the time the property was acquired any special reason why it should not be developed for the purpose desired. Land was then reasonably cheap and its comparatively remote location was probably a reason why it was purchased instead of a property along the Harlem river that was accessible for scows and boats and which would make an ideal terminal. Water frontage was expensive then, but it is much more costly now.



The Repair Shop of the Ames Transfer Company, Admirably Equipped and with Capacity for Three Trucks, in the Yard at 236th Street and Kingsbridge Avenue.

particularly when contracts were made in competition. But there was knowledge of what could be done with mules and there was no real basis on which truck service could be estimated. If more mules were bought this meant a greater number of animals idle during the winter.

#### First Truck Bought in 1911.

After the New York motor truck show in 1911, at which the Messrs. Ames were very much interested and made careful investigation of a considerable number of machines, they decided to experiment. They were by no means satisfied that they could economize with trucks and they decided to buy one machine only, and this was a five-ton Pierce-Arrow. The necessity of saving the time of the truck while making deliveries impelled the ordering of a dumping body, which at that time was manually operated. This truck was the second machine sold in New York City, and probably the second in the United States, the first going to Arbuckle Brothers. This was delivered at the beginning of the summer of 1911, and it was worked doing long distance haulage as a rule, although considerable experimenting was done with it to ascertain its capacity when used in the same work as the mule teams and trucks.

As the conditions are not often favorable for haulage where building operations are in progress and frequently teams making deliveries had to have help in excavations or soft ground, the power of the truck was such that it could be quickly worked wherever traction could be found. The experience demonstrated that the truck could be loaded as quickly and unloaded quicker, that it had what may be termed constant load capacity without reference to weather conditions, and it had greater speed.

The result was so satisfactory

that early in 1912 three more trucks of the same type were ordered. No more mules were bought and more contracts for longer haulage were taken. The yard of the company is on both sides of Kingsbridge avenue, and one section contains the stables, while the other is a wagon yard with a single story building used for storage of carts and wagons on one side, and at one end is now a repair shop and a blacksmith shop, over which is the office. This is below the level of the street and is reached by a roadway.

The trucks were housed in the building in the yard and a mechanic was engaged to give them such attention as was possible with hand tools, but all repairs or overhauling was to be done at the service station of the Pierce-Arrow agent. The results from the truck were entirely satisfactory during the year and early in 1913 three more were ordered. With the delivery of these the plans of the company were considerably changed. A loading pocket was built close to the stationary crane at the Interborough dock which could be kept filled and from which loading could be done by gravity, so that there were no need for the trucks to be held at the water front, and the capacity of the pocket is such that it would store enough to load several trucks or carts.

To economize the handling in the scows and boats clam shell buckets were utilized, so that a very large tonnage could be unloaded in comparatively short time in the event of need. This was the best facility available, and this is now in use. With the delivery of the trucks delivered in 1913 some of the mules were disposed of and with the experience of the previous years more satisfactory results were obtained. The following year three more trucks were purchased,



The Blacksmith Shop of the Ames Transfer Company, Which Is Operated in Connection with the Truck Repair Shop, Originally Constructed to Shoe Animals and do Wagon Work.

making 10 in all, and more mules were sold.

This fleet required different attention than had been given before and while there was ample storage room available, the company built a shop at the back of the yard of a size that will take three trucks and have sufficient space for machine tools and benches. This building was erected and equipped and then the company had facilities for doing all its repairing and overhauling, aside from making large parts, and a stock of spares was obtained. This shop is admirably equipped, having lathes, drill presses, milling machine, shaper, grinder and a complete outfit of hand tools, and the layout is with reference to economizing time and labor and doing a high grade of work. There is a large pit in the concrete floor, over which a chassis can be placed whenever desired, so that working from the floor is unnecessary. The power is electricity and the entire lower front of the building is doors, so there is exceptionally good light. In the shop is stored the parts and material, there being supplies on hand to meet any emergency.



The Yard of the Ames Transfer Company. Showing the Rear Buildings Only, from the Site of the Garage That Is to Be Built This Summer.

With the erection of this shop and the blacksmith shop available for doing hand forging or any welding or fitting, the company was ready for establishing its policy, which three years' experience had impelled, and that was the disposal of the mules and the use of nothing but machines. This policy was carried out at the beginning of 1915, when 10 trucks were bought and most of the mules were sold. This made the fleet of machines 20 in all.

#### Doing Haulage at Long Range.

Obviously 20 trucks was more than equal to the capacity of 100 mules worked in teams of two and four, but the company was seeking other work that would be profitable. It made contract with the Inter-Continental Construction Company, which is building a section of the subway for the Brooklyn Rapid Transit Company in the eastern parkway, from the Plaza to New York avenue, a distance of about 1¼ miles. This is an open cut in the parkway and the excavation is done with steam shovels. Five trucks were placed in this work, the excavated material being hauled from

the parkway to what is known as O'Brien Brothers' dump at the foot of Clinton avenue, at the Wallabout basin, where it is loaded into scows at the water front. This haul is approximately two miles. There was about 75,000 cubic yards of material to be removed from this cutting (more than would be required from tunnel work) and the greater part of it was sand or correspondingly loose material that could be easily worked.

As the trucks could not be sent to the work from the Kingsbridge yard and return each day, a building that had been used for a stable at 14 Steuben street, Brooklyn, was rented and from this the machines were operated under the direction of a foreman, and a man who is a mechanic was employed as watchman, whose duties included making adjustments and such repairs as were practical with hand tools. This plan of operation was found to be in every way satisfactory. In the event of needed repairs the machine was sent to the main yard and another truck ordered to Brooklyn to replace it. In this manner all that was desired in the way of attention could be given with a comparatively small expense for garaging.

The first machine bought was not equipped with a power hoist because no standard equipment had been adopted by the Pierce-Arrow Motor Car Company, but when that company adopted and recommended a hydraulic hoist operated by the engine, which could be absolutely controlled, practically all the trucks bought were so equipped. The stationary derrick at the Interborough dock and the loading bin were found to be insufficient equipment because of the fact that with two boats to be unloaded only one could be worked on at a time.

This condition was met by securing the use of a locomotive crane, which may be placed anywhere along the front of the dock, and operating this with a clam shell bucket the trucks could be loaded directly from the boats. With this equipment unloading could be done much faster than the freight could be handled by the trucks, and when necessary the material was accumulated on the dock deck and loaded into the trucks by the crane and clam shell bucket as desired. While this necessitated two handlings, the plan released the boats so that demurrage on them was not often paid. Obviously a series of storage bins and pockets could not be constructed the length of the dock, although such a facility would be a desirable economy.

#### Building Operations Increase Haulage.

Within the last five years building operations on the north end of Manhattan Island and in the Bronx have been very large, especially along the principal avenues, and each year the development has been fur-



ther inland. As a very large part of the materials are brought into the Harlem river by scows and boats, these are hauled from the docks, so that the transportation requirements have been constantly increasing. This demand, with the possibility of general contract work, impelled the company this year to buy five more trucks, two of which are in service, and the delivery of the others is expected in a very short time. The company now has 22 machines in use, five of which are worked on the subway construction in Brooklyn, and two are working on a large contract at Glen Cove, Long Island, making 15 in service at the Kingsbridge yard.

The mules have been disposed of and the company now has but two horses, which are worked about the yard and are rarely used for haulage of any kind. The stables are now given over to the storage of building materials, and the purpose of the company is to deal extensively in these—that is, to a greater extent than ever before. The company has no intention of contracting to do construction work, but will continue to specialize haulage and will increase its equipment as the needs are demonstrated.

#### **Will Build Three-Story Garage.**

Plans have been accepted for the building of a three-story building, 100 by 65 feet, at the front of the yard, which will have two floors above the street level. This is to be used exclusively for a garage, and as it will have 19,500 square feet of floor space, this will be sufficient for considerable expansion, which is expected will be necessary. The present building that is used for storage of the trucks, and which is shown in the illustrations where the trucks are lined, will be given over to storage purposes.

The garage will be equipped with all facilities and labor saving devices and will be completed the present season. It will be a fireproof structure so far as this is possible and will be thoroughly protected. The repair shop will not be changed, as this is admirably arranged and equipped and is sufficient for all work that is necessary on a considerably larger number of machines than are now in service.

#### **Engage Only Expert Drivers.**

The policy of the company has been to engage good drivers and to select men who are reliable and demonstrate their capacity, paying good wages and giving the men regular employment. This is possible from the fact that with the trucks there need be no period of inactivity during the year. During the winter months there is a very great deal from coal dealers and other concerns for trucks and the machines can be worked at very good profit, arrangements being practical so that they need not be driven to the yard each night unless the work is within reasonable distance. In the spring the usual work of the company can be taken up and the equipment can be placed in the best of condition for the season without loss of valuable time. This class of work is because of the long range utility of the trucks, while animals can be worked but comparatively short distances from the

yards or stables. With trucks there is constant work and no period of inactivity.

The economy of the trucks as compared with the animal equipment cannot be determined with any degree of accuracy, because the work done with them is over longer distances and a different character than was done with mules. Taking a given work the time and expense of both classes of vehicles, based on tonnage carried, can be precisely figured, and there is no question whatever that there is a large saving with the machines where they could be worked against animals, but considering the continuous work of the year and the advantageous contracts that can be obtained at distances beyond what horses could be used without temporary stables, the superiority is again evidenced.

#### **Contractors Favor Truck Service.**

Besides these considerations, in contract haulage time is a very important factor with contractors, and truck equipment is given preference by them as against horse equipment. The reserve capacity of trucks, which is practical by working them with two or even three shifts of drivers, is another distinct advantage that is relied upon by contractors and which is provided for by those who specialize haulage.

But with reference to the economic possibilities of trucks, the purchase of 25 machines by this company, and its provision for still further expansion of its equipment, is substantial evidence that cannot be denied. So far as is possible the company has made endeavor to economize time and labor. The derricks and loading pockets at the Interborough dock, the equipment of all but three of the trucks with hydraulic hoists (the three mentioned are equipped with stake bodies for carrying materials for which dumping bodies are not suited), and arrangements for contractors for the installation of dumping platforms and hoists where trucks can be operated without loss of time, are practically adaptable for all concerns doing similar work.

#### **Spare Engines and Wheels.**

The company has provided all that is necessary for maintenance of its trucks to a standard of efficiency. The machines are operated under the direction of the owners, but the mechanical upkeep is in charge of a foreman mechanic who has three men who work constantly on the trucks. These men are expert in their work and they have everything that is necessary with which to do work that is equal to that of service stations. The company has a spare engine which is kept in first class condition, and should there be need a complete power plant is taken from a chassis and replaced with the spare, so that there is minimum time lost if this work is done during the day, and without loss of truck time when done at night. When the removed engine is repaired a thorough work is done and it is replaced. With this system no truck need be withdrawn from service, and an exchange can be made very quickly.

The company has spare rear wheels that are gen-

erally used when tires are replaced. If a front tire is to be changed the wheel is taken off and the service department of the tire company notified. A machine calls at the yard for the wheel and takes it to the service station, where replacement is made, and the wheel is returned. The mechanics come to the yard early and replace the wheel so that the truck can leave on time. When a rear tire is to be changed, however, a spare wheel is put on and the wheel removed is sent to the service station. This insures against any loss of time, for removing and replacing a rear wheel is a longer work than with a front wheel.

#### **Served by an Emergency Car.**

The drivers are experienced men, all having sufficient practical knowledge of their machines to make such adjustments as might ordinarily be required in normal operation, and in the event that a truck becomes inoperative the foreman at the yard is communicated with by telephone. He has a light runabout in which is carried a very complete set of hand tools and such parts as might be generally needed. When notified the foreman selects whatever may be necessary to deal with the condition described by the driver, in addition to what is customarily carried and goes to the truck. He makes whatever repairs are needed for it to continue, or so that it may be taken to the yard for shop work. If necessary the office is notified and another truck is sent out to replace it.

The endurance of the machines has been exceedingly satisfactory. The Messrs. Ames say that truck No. 25, the first purchased, is just as efficient as when new, and there does not now appear to be any visible limit to its service life. The truck has been in use almost five years, and has been worked practically every working day aside from the time required for two overhauls. The average mileage of the trucks is 55 daily, so that this machine has been driven about 15,000 miles a year, making conservative estimate. Taking the five years the total has been not far from 75,000 miles, and the same worm shaft and gear wheel are in use that were originally installed in the truck. The results with the older trucks are equally as satisfactory, although the mileages are not as large. Only in one instance has a worm shaft and gear wheel been replaced, and that was caused by a ball of a bearing breaking and pieces of the ball being carried between the worm and wheel, causing considerable damage.

#### **Very Large Tire Mileage.**

With continued use of the trucks better tire mileage is obtained. This is believed to be due to the improvement made in compounding the rubber and the manner of attaching them to the rims. With the tires now used the guaranteed mileage is invariably much exceeded unless the shoe is damaged through accident, and more than 16,000 miles driving is not unusual from rear shoes. As a rule the mileages of front tires do not equal those of the rear wheels, principally from the wear in steering, contacting with rails and ruts, road obstructions and the like.

While the system of accounting is simple, it is ac-

curate and care is taken to note every operating expense. The driver is required to make daily report on a card that shows the number of gallons of gasoline consumed and the pints of motor and gear oils used, the miles driven, the tonnage carried out and in, the number of stops, the tire replacements, the net running time and with such other facts as the drivers believe should be submitted. On the reverse of these daily cards are summarized the work done. From these cards the charges are made out for the customers and the operating items are noted in records.

#### **Can Easily Follow Operating Expense.**

Because all of the repairing is done by the company's employees, repairs can be accurately noted from the records of the foreman of the shop. When outside work is necessary this can always be followed. By keeping the machines in the yard the cost of storage is minimized and the overhead expense is considerably reduced. The investment in wheels and tires and the spare power plant is carried separately and each truck is charged according to the use made of these units. The company has outside charges at times, because of the Brooklyn garage, and there are now two trucks engaged on a contract at Glen Cove, Long Island, but these are provided for in the prices that are obtained for the work and when trucks are not kept at the yard they are not charged with the pro rata of overhead such as garaging, heat, light, water, etc., because these are taken care of in the prices paid for the services of the machines.

The drivers report at the yard, or where their machines are garaged, in ample time to fill the fuel, water and oil tanks and grease and oil the trucks and reach a work when the other workmen begin. Usually the drivers are on hand about 6 o'clock each morning. Ordinarily the trucks are back in the yard by 5 in the afternoon, although there are instances where their returns are much later. Long distance hauls, that is, with destinations from 50 to 75 miles distant, are seldom undertaken.

The drivers are instructed not to overload the trucks and to use care in handling them in conditions where they might be strained excessively. That this policy is advisable, rather than overloading. The men are supervised by the foreman or by members of the company, who drive from the one work to another, and the exercise of constant care insures high efficiency and maximum economy.

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#### **BOSTON DEALERS ELECT OFFICERS.**

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The members of the Boston Automobile Dealers' Association at the annual meeting held June 6 elected J. H. MacAlman president. The other officers were elected as follows: Vice president, J. S. Hathaway; treasurer, F. A. Hinchcliffe; secretary and clerk, Chester I. Campbell; directors, J. H. MacAlman, J. S. Hathaway, F. A. Hinchcliffe, J. W. Maguire, C. P. Rockwell, F. E. Wing, J. W. Bowman, C. E. Fay, J. H. Johnson.

### TRUCK DERAILED FREIGHT CAR.

An accident that was of unusual character and which unexpectedly tested the construction of a five-ton Packard truck quite beyond anything that had been conceived by the engineers of the Packard Motor Car Company, its builder, happened in a freight yard at Troy, N. Y. In designing Packard trucks provision is made to endure practically every stress that might result in normal use and the factors of safety are based on reasonable operation, for obviously limitations must be established and observed.

The truck that was the subject of this test is owned by Fitzgerald Brothers' Brewery, Troy, and it had been sent with a load of barrels and kegs to transfer these to a freight car for shipment. The car was on a siding and the truck was backed against its side so the transfer could be easily made, the front wheels being on a track that paralleled that on which the car was standing, the truck being diagonal with reference to the freight car and tracks.

A switching engine backed two cars along the track on which were the front wheels of the truck, and before the engine could be stopped one of the cars struck the front of the truck, forcing it backward against the car that was being loaded. The result was that the car was forced completely off its wheel trucks and fell on its side, and this sufficiently released the pressure on the front of the truck so that the cars were forced past it. Though the stress upon the truck frame was not full nor direct and was unlike any the machine is designed to withstand, it did not buckle, and a careful examination did not disclose damage to it. The engine, the radiator and the steering gear of the truck were somewhat damaged, but considering the accident they were comparatively slight and the machine was soon in operation.

### DRIVER LIABLE FOR DAMAGES.

The Nebraska supreme court has decided that the driver of a motor vehicle concerned in an accident, who is at the time violating the law, becomes liable for civil damages sustained by an innocent victim, even though such liability is not specifically provided for in the statutes.

A proposition to merge the Willys-Overland, Hudson Motor Car, Chalmers Motor and Auto-Lite companies into a \$200,000,000 corporation, which was given considerable publicity, has been abandoned, for the time being, at least.

### CO-OPERATIVE DELIVERY.

#### Systems Productive of Good Service at Small Operating Cost.

There is opportunity in every town for the development of a central delivery system which will take over the delivery of all the local retail merchants and cut the cost per package greatly for each of them, while it improves the service according to T. J. Hudson, manager of the truck department of the Chicago Pneumatic Tool Company, which builds Little Giant trucks.

That it is practical for an outside delivery man to handle deliveries has been shown in Champagne, Ill., and Ann Arbor, Mich., where such systems are now in successful operation. In spite of the great advantages in keeping the delivery machines going all the time under more nearly full loads, the systems have developed slowly because of commercial jealousies of



Packard Truck That Was Forced Against a Freight Car at Troy, N. Y., Completely Overturning It, Without Bending the Truck Frame.

merchants who are reluctant to agree to a common delivery service, believing they might not be given equal consideration.

There is a vast waste in the present unorganized system, because when each store has its own wagon two or three may stop at the same house in a day, where one would have been sufficient, and many of the wagons carry but parts of loads instead of full loads.

In Mr. Hudson's opinion an outside business man has a better chance of bringing about the adoption of such a system than a merchant who would be suspected by his competitors. The logical equipment is small trucks for house to house deliveries and larger vehicles to haul goods from the freight stations and piers to the stores. A central station is necessary, to which goods may be taken from the different stores, sorted and routed. The systems now in operation have regular scheduled trips, with two to four deliveries a day, and all merchants' parcels have exactly the same delivery service.

## MACAULEY IS PRESIDENT.

### Succeeds Henry B. Joy as Head of Packard Motor Car Company.

Alvan Macauley has been elected president of the Packard Motor Car Company, Detroit, Mich., to succeed Henry B. Joy, who will remain chairman of the board of directors of the company. Mr. Macauley's election was brought about at the request of Mr. Joy as a recognition for the former's successful handling of the company's business.

Mr. Macauley, who was formerly vice president and general manager of the company, becomes its head at the age of 44 and is executive of 12,000 workmen and the administrator of an investment of more than \$2,000,000. He has had an exceptionally brilliant professional and business career. He was born in West Virginia. After attending Lehigh university he was graduated from the law school of George

Washington university, Washington, D. C., and was admitted to the bar in the District of Columbia and in the State of Ohio.

He later became identified with three of the most successful manufacturing concerns in the United States, being successively connected with the National Cash Register Company, the Burroughs Adding Machine Company



Alvan Macauley, President, Packard Motor Car Company, Detroit, Mich.

and the Packard Motor Car Company. He left the Cash Register company, of which he was patent attorney, to become general manager of the Burroughs Adding Machine Company, after spending six years with the former concern. In 1910 he became general manager of the Packard company and in 1914 was promoted to the position of vice president and general manager.

Besides being a business genius, Mr. Macauley has distinguished himself as a patriot, announcing soon after the European war started that the employees of the Packard factory must be loyal to the American flag in order to obtain promotion to positions of responsibility and trust, and that those of foreign birth must at least have declared their intention of becoming citizens.

Mr. Joy will continue to be an active spirit in the welfare of the Packard enterprise, which he brought

to Detroit from Warren, O., 13 years ago. In Detroit he is looked upon as being one of the principals responsible for making that city the largest automobile manufacturing centre of the world.

At the annual meeting the stockholders of the company authorized an increase in the common stock from \$8,000,000 to \$13,000,000, bringing the company's total capital stock up to \$21,000,000, of which \$8,000,000 is seven per cent. cumulative preferred.

Announcement has also been made that the company is to have a \$1,000,000 plant at Long Island City, N. Y. The block purchased for the erection of the plant fronts on Queens boulevard, between Hill and Rawson streets, and adjoins the site now occupied by the Packard building. It is to be 10 stories in height and will have double the capacity of the present structure, which is between Hill and Van Dam streets, Long Island City. Plans are also being prepared for an eight-story addition to the old plant there, which is to cost about \$350,000 and will have an area of 90,000 square feet. An addition fronting on Hill street, which cost \$50,000, is nearing completion.

## BROCKWAY IN NEW YORK.

The Brockway Motor Truck Company, Cortland, N. Y., has opened a branch in New York City under the management of Van Tassell & Kearney, a firm that for many years was prominent in the horse and carriage trade. The sales rooms are located at 125-129 East 12th street.

W. L. Van De Wiele, formerly connected with the International Motor Company and the Garford Motor Truck Company, is sales manager of the company. An order for 33 two-ton trucks, complete with bodies, was recently received from the Adams Express Company. This sale attracted widespread attention, as the express company has had years of experience in the use of trucks and its selection of Brockway trucks is looked upon as testimonial of Brockway merit.

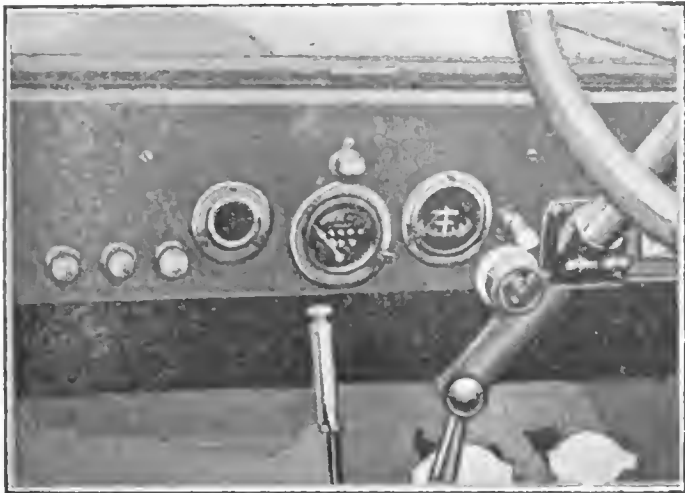
## EXPECT HIGHER OIL PRICES.

Owing to the fact that the consumption of oil continues to increase at a greater ratio than the production, it is expected in crude oil circles that another advance in price will be made before the end of this summer. A year ago there was a plethora of oil in the mid-continent field, but this year there is an actual shortage, although drilling is going on much faster than last year. Following the decline in premiums in the mid-continent field from 70 to 40 cents a barrel, they have again advanced to 60 cents.

The Boston and Montana Development Company is using White trucks for the transportation of ore from French Gulch and the Elkhorn mines to the smelter at Anaconda. The company has contracted for more White and Peerless trucks and trailers to be used in the same work.

## KEROSENE AS A PRACTICAL ENGINE FUEL.

**B**ECAUSE of the enormous demand for gasoline for the operation of military trucks, tractors, cars, aeroplanes, etc., there is a very limited supply for pub-



Three Push Button Control of the Two Kerosene Valves and the Air Valve at Left; at Right of Ammeter Is the Switch for the Electric Heater Circuit and the Inspection Lamp.

lic service in the United Kingdom and the prices charged are almost prohibitive of its use. It is interesting to note that English inventors are striving to find a fuel, other than gasoline, which can be successfully used in the gasoline engine without material change in the design, construction or means of carburetion. Recent reports from abroad indicate that these endeavors are meeting with some degree of success.

Kerosene has many times been experimented with as an engine fuel in this country, but never with sufficient success to justify its general use. In a recent issue of the *Autocar*, an English automobile publication, was published an article illustrating and describing an invention by F. A. Wilkinson, Hatfield, Hertfordshire, England, with which kerosene can be used in the ordinary gasoline engine without any admixture of a lighter fuel.

It may be well to state that no attempt is made to classify kerosene, or paraffin, as it is known abroad, on the same high standard as gasoline as a fuel, even after the addition of his invention to the engine. Mr. Wilkinson states that even with the installation of his device the chief disadvantages of kerosene are that until the engine becomes thoroughly hot, the exhaust is decidedly smoky and that the same flexibility of engine operation is not obtainable. The one viewpoint in the mind of the inventor has been to obtain a means of carburetion by which kerosene, which is plentiful and within the means of every motorist, can be used to operate the ordinary engine without structural alteration of the motor or carburetor.

### Principle Somewhat Revolutionary.

The basis of this invention is of somewhat revolutionary nature, in that a portion of the exhaust gas

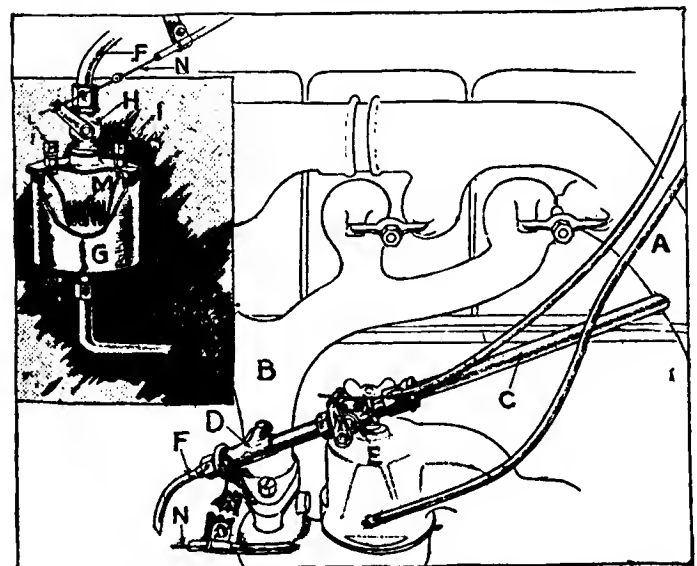
is injected into the intake manifold between the throttle and the engine. This hot gas mixes with the kerosene and air and enters the cylinders for the second time. Although it is but natural to suppose that the introduction of exhaust gases into the cylinders with the new charge would decrease the efficiency of the motor, exhaustive tests determine that the mileage per gallon when running on kerosene is reduced by only two miles as compared with gasoline.

The reader will, no doubt, more clearly grasp the principle involved by referring to the accompanying illustration. A represents the rear end of the exhaust branch, B the intake manifold, D a T piece which screws into the intake manifold, B and C a pipe having an internal diameter of  $\frac{1}{4}$  inch, which is coupled between one arm of the T piece and the exhaust pipe A. In the pipe C is the valve E, which regulates the volume of exhaust gas admitted to the intake manifold. The control of this valve is obtained by a steel wire running through a copper tube and terminating at its upper extremity in one of three push buttons arranged in a row on the left rear face of the dash board and within easy reach of the operator. It has been determined that when the engine is hot this valve should be about three-quarters open, and, as the engine speed decreases, it is advisable to close it slightly.

In another illustration is shown the three button controls on the dash. The button on the right controls the auxiliary air supply to the carburetor, the centre one the valve E, while that on the left operates another valve, H, the purpose of which is related in the next paragraph.

### Fuel Heated by Electric Coil.

That kerosene may be used for starting purposes



Sketch of Wilkinson By-Pass Kerosene Vaporizing Attachment. Inset Showing the Electric Heater for Starting.

it is necessary to install an electric heater. It will be noticed that the second arm of the T piece D is attached to the pipe F, the internal diameter of which is



3/16 inch. In the pipe F is located the valve H, which controls the passage of the kerosene from the heating pot G to the T piece D. For simplicity of explanation, the heater G is inset on the left of the illustration, but in reality it is fitted low down and on a level with the carburetor float chamber. From the bottom of G a 3/16 inch pipe connects with the bottom of the carburetor float chamber, so that the level of the fuel in the float chamber regulates that in the heater pot G. Into the lid of G are inserted two terminals L, which are insulated from the metal of G and connected together inside the heater by the resistance wire M.

The current is taken to the terminals L from the electric lighting battery, the heater being arranged to operate from either a 12-volt or a six-volt source of current. A switch is located on the dashboard of the car and by this means the current is allowed to pass through the heater G. Included in this circuit is a small inspection lamp, mounted near the switch on the dash.

#### Starting the Engine When Cold.

When one desires to start the engine from cold the valve E is closed, the valve H opened by means of the control wire N and the carburetor throttle closed so that the suction of the pistons causes a reduction of pressure in B, which is transmitted through D, F and H to the kerosene in G. Before a start can be made it is also necessary to turn on the current through the resistance wire M in the heater G, and leave it on for about 2½ minutes. At 12 volts the amperage discharge is approximately 16 and if a six-volt battery is used there will be about a 32-ampere discharge.

After the resistance wire M has been heating the kerosene in G for the stipulated time, the fuel in G becomes very hot and smoke will be seen to issue from the heater pot. The current can then be switched off and the engine started either by the electrical starter or hand crank.

The inventor informed an engineer from the Auto-car during a test conducted with an Overland car that immediately after the motor is started the car should be taken out on the roadway and made to pull on an open throttle so that the greatest amount of heat possible will be taken from the exhaust pipe through the by-pass C. It was also noted that no fuel was drawn from the heater G except at the moment of starting. When firing commenced the valve H was closed and the valve E opened, as was also the carburetor throttle valve. The specific gravity of the kerosene used for the test was .798.

Mr. Wilkinson states that the electric heater is not absolutely necessary for starting, as the kerosene can be drained from the carburetor float chamber and then filled with gasoline. The heat developed in this manner is sufficient to enable the operation to be maintained on the heavier liquid after the gasoline has been consumed.

A noteworthy feature of the by-pass paraffin attachment is that should one ever desire to operate the

engine with gasoline the only necessary change is to close the two valves E and H.

There may be no organized or concerted endeavor made in America to utilize kerosene as engine fuel so far as pleasure cars are concerned, because there is greater degree of "carbonization" or incomplete combustion in engine in which kerosene is used because the oil burns slowly and is not always completely consumed, but there is no doubt whatever that kerosene will be an extremely economical fuel for trucks and farm tractors, which are multiplying in numbers very rapidly. Not only this, the far greater safety of kerosene, for it is not as combustible as gasoline, is a distinct factor, and the price is comparatively small as compared with the present cost of fuel.

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#### SMITH TO SELL VIM TRUCKS IN NEW YORK.

Mr. Gordon Smith, the pioneer salesman of the Vim Motor Truck Company, and sales manager of the Philadelphia district, has become sales manager of the Manhattan Motors Corporation of New York City, which company is the New York distributor for the Vim trucks, with offices and sales rooms at 56th street and Broadway.

Mr. Miltenberger, president of the Manhattan Motors Corporation, appointed Mr. Smith because of his remarkable success in organizing the Vim sales force in Philadelphia and developing it to a point of high efficiency.

J. P. Cranston, formerly treasurer of the Bateman Manufacturing Company, Glen Rock, N. J., manufacturer of farm tractors, will succeed Mr. Smith at Philadelphia as sales manager. The new factory at 23d and Market streets, Philadelphia, is nearing completion, and when it is occupied the old building is to be turned into the finest service and sales station in that city. There will be twenty salesmen connected with the salesrooms and more than 50 men in the service department.

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#### BESSEMER TRUCK PRICES.

The advertisement of the Bessemer Motor Truck Company, published in the May issue of Motor Truck, stated that the price of the model D Bessemer truck was \$2000 and that of the model E Bessemer truck was \$2800, which was an error in both instances, these machines being listed at \$2200 and \$3100 respectively. Both of these vehicles are driven by worm and wheel power transmission systems and are two and 3½ tons load capacity.

Fruit farming is developing rapidly in South Africa and Special Agent Juan Homs reports that if a good orchard tractor were demonstrated in some of the fruit districts a number of sales would result. The machine would have to be low enough to pass under trees and plough close up to them.

**TEN TRAINLOADS OF PACKARD TRUCKS.**

A single shipment of 460 Packard trucks was made from the factory at Detroit, Mich., to Gaston, Williams & Wigmore, New York City, purchasing agent for the English, French and Russian governments, during the week beginning June 6. This was made in 10 trains, each of 46 cars, each car carrying two trucks. The value of the shipment was more than \$2,000,000 and is said to be the largest ever made by any one firm in America manufacturing motor vehicles.

**ESSEX WORM DRIVE TRUCK FOR \$750.**

The Essex Motor Truck Company has been organized at New York City by John T. Rainier and Paul Lineberger, the former being president and treasurer, the directors of which include Gottfried Piel, William Piel, George Ehret, Christian W. Feigenspan, Adolph Kuttroff and Carl Pickhardt. Messrs. Piel, Ehret and Feigenspan are well known throughout the brewery industry as being especially successful. Mr. Feigenspan is president of the Federal Trust Company, Newark, N. J., and Messrs. Kuttroff and Pickhardt are identified with a large chemical importing house. The engineer of the company is Carl Neracher, who was chief engineer of the Willys-Overland and Garford Motor Truck companies.

The company has capital of \$600,000 and will establish factory on Long Island. Offices have been located at 299 Madison avenue, New York City. The intention is to build a truck having 1000 pounds load capacity, that will have a specially built engine and Timken axles will be used, the power transmission being by worm shaft and wheel. The truck will be sold for \$750 and production will be begun in September.

**WILL BUILD \$3,000,000 OIL PLANT.**

The Vacuum Oil Company has purchased over 600 acres of ground at Lincoln Park, N. J., just opposite Philadelphia, and will build an oil refining plant which, with piers, docks and trackage is expected to cost \$3,000,000. Three large tank ships are being built by the company and the government is dredging the Delaware river on which the new property is located.

H. G. Haskell has been appointed sales representative for Ohio for the Redden Motor Truck Company of New York. He was formerly president of the Velie Motor Company of Cleveland, O.

**EMERGENCY TRUCK SERVICE.****Private Equipment Answers All Summons to Benefit Chicago Public.**

Through the installation of an emergency truck by the People's Gas, Light and Coke Company of Chicago, a valuable public service has been established. The truck, which is 1½ tons capacity, is sent out to all big fires to take care of gas leaks, to sewer and street cave-ins, to accidents in buildings, asphyxiation cases, suicides, drownings and in all other cases where there would be the possible need of a pulmotor. The truck may be called out at any time of the day or night by the police, physicians or private individuals without any expense, and will respond to any summons within the city of Chicago, which covers an area of over 80 square miles of territory.



White Truck Chassis, Equipped as an Emergency Wagon for the People's Gas, Light and Coke Company, Chicago.

In the case of fire calls the crew of the truck finds its principal duty is shutting off gas mains and connections to prevent explosions and the spread of the flames and, being expert in the use of the pulmotor, can render quick assistance to anyone overcome by either gas or smoke. The truck, which has a 45-horsepower motor, has all the speed that is permissible through the dense traffic of the city and quite frequently arrives at fires and the scenes of accidents before the police or fire departments. Before it was put into service there were many instances where firemen were handicapped by not being able to discover gas leaks and delayed again by not being able to locate the shut off valves.

As a result of the inauguration of this service, the officials of the People's Gas, Light and Coke Company have been highly commended, although their motive was not entirely unselfish, as through it they have saved many thousands of dollars for the company by preventing loss of product, as well as demoralization of public service in the event of large fires, which is a material factor for municipal convenience.

## MODEL T WISCONSIN MOTOR.

### Long-Stroke, Four-Bearing Type Designed for Heavy Truck Service.

The model T engine, built by the Wisconsin Motor Manufacturing Company, Milwaukee, Wis., is designed especially for heavy duty service in trucks and is intended to have exceptional endurance as well as unusual operating economy and efficiency. The engine is constructed by the same engineers and the materials and workmanship are the same as are used in the construction of Wisconsin engines for pleasure cars, which have proven to have remarkably high qualities in all classes of service.

The model T engine is designed for suspension at three points and can be used in connection with a unit power plant or independent from the transmission gearset. It is a four-cylinder, four-cycle, water cooled, L head type with the cylinders cast en bloc. The cylinders have bore of four inches and stroke of six inches, and it is rated according to the S. A. E. formula at 25.6 horsepower, but as the bore to stroke ratio is 1:1.5, the engine will develop much in excess of this—probably not far from 40 horsepower when driven at maximum speed. The chrome nickel steel crankshaft, which is heat treated and has tensile strength of 125,000 pounds to the square inch, is mounted on four main bearings, which are at either end and between the first and second and the third and fourth cylinders. This design is said to considerably decrease the bending stress and all the arms are the same length—one-half the stroke. The pistons and connecting rods are, as in all Wisconsin engines, of light weight.

The engine is cooled by the use of extra large water jackets and water circulated by a centrifugal pump, as well as a fan mounted on an adjustable

bracket and on bearings that are driven by a half-inch V shape belt. The oil is carried under pressure to all bearings under pressure by the Wisconsin standard force feed system, and continual priming of the oil pump is assured, as it is located in the oil sump and is entirely enclosed and submerged in oil. The pump can be removed without taking off the lower section of the crank case whenever cleaning is required. The pump is surrounded by a filtration screen.

The intake manifold of the engine is so designed that it is very direct, there being no pockets that would impede the admission of the fuel gas to the cylinder chambers. The magneto coupling is a special type that affords unusual flexibility in the adjustment of the magneto. The design of the engine is such that it can be equipped with any of the standard makes of two-unit starting and lighting systems, and the duplex governor can be installed. Provision is made for bolting the engine to a steel supporting arm at the rear, which makes for a stronger construction than aluminum arms cast integral with the crank case.

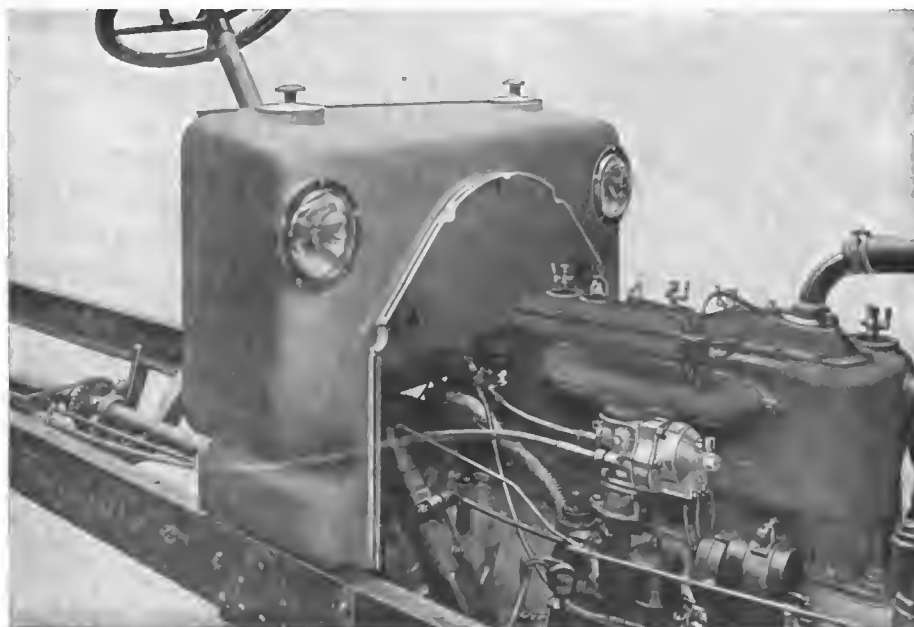
### TRUCK COMPANY INCREASES CAPITAL.

The capital of the Hurlburt Motor Truck Company of New York has been increased from \$150,000 to \$450,000. The company's business in 1915 showed an increase of 500 per cent. and the orders now on the books are greater than the entire business of 1915.

### BREWER SAVES TIME WITH TRUCKS.

The use of a Pierce-Arrow truck by William Ulmer of New York City in transporting beer not only has cut the time of delivery from 19 hours to five hours, but it is delivered at destinations in better condition, as long exposure to light has a deteriorating effect on that beverage.

Under the system formerly used by Mr. Ulmer, the beer was first hauled to the freight station, where it was put aboard freight cars for shipment to points on Long Island, to be taken off and delivered by local horse drawn delivery. About 19 hours was the average time consumed in transit with this method, while now Glen Cove, Oyster Bay and Locust Valley figure in one trip that means 55 miles a day. The Coney Island return trip is made between the hours of 7:40 and 10:50. Oyster Bay takes from 7:40 a. m. to 5 p. m., and the Hicksville and Westbury trip, 50 miles, means 7:15 to 5:15.



A Wisconsin Model T Heavy Duty Engine, Developed Specially for Truck Service, Equipped with a Duplex Governor, Installed in a Chassis.

## N. A. C. C. ADOPTS SERVICE POLICY.

**Obligations of the Manufacturer to the Purchaser Clearly Established—Col. Clifton Again President---Truck Shows "Not Necessary" in Makers' Opinion.**

**A**SIDE from the election of directors and the choice of officers by the board for the year to come, one of the most important actions by the National Automobile Chamber of Commerce at its annual meeting, held at New York City, was the consideration of the proposition to hold motor truck shows and the decision that no exhibitions of trucks was necessary from the viewpoint of the body. This decision was not unanimous, for a considerable number of truck manufacturers believe that the best interests of the industry would be conserved by such exhibitions, but this group was not in the majority and all hope for the support and co-operation of the organization in shows during the coming year are necessarily given over, unless there be later action which will rescind the determination. Another was the adoption of a standard service policy.

The 97 companies having membership in the chamber were practically all represented at the meeting and the choice for directors was Charles Clifton of the Pierce-Arrow Motor Car Company, Buffalo, N. Y.; John N. Willys of the Willys-Overland Company, Toledo, O.; R. D. Chapin of the Hudson Motor Car Company, Detroit, Mich.; H. H. Rice of the Waverley Company, Indianapolis, Ind., and J. Walter Drake of the Hupmobile Company, Detroit, Mich. After the organization of the board the following officers were



Col. Charles Clifton, President,  
N. A. C. C.

elected: President, Charles Clifton; vice president, Wilfred C. Leland, Cadillac Motor Car Company, Detroit, Mich.; second vice president (gasoline division), Hugh Chalmers, Chalmers Motor Company, Detroit, Mich.; second vice president (commercial vehicles division), Windsor T. White, White Motor Company, Cleveland, O.; second vice president (electric vehicle division), H. H. Rice, Waverley Company; secretary, R. D. Chapin, Hudson Motor Car Company; treasurer, George Pope, and general manager, Alfred Reeves.

### Commercial Chassis Defined.

The representatives of the companies manufacturing trucks met in convention the day previous to the annual meeting of the chamber, at which time the subject of shows was discussed and recommendations made that were later adopted by the chamber. Similar action was taken relative to the definition of standard chassis for gasoline and electric commercial vehicles, which definitions were as follows:

**A standard chassis of a commercial vehicle to be propelled by an internal combustion engine shall consist of an assembly of all essential parts of a truck chassis with protective housings, ready for operation on the road, including set of tires attached to wheels; driver's seat with padding or cushion on all chassis rated at one ton capacity or more; front wheel fend-**



Windsor T. White, Second Vice  
President, N. A. C. C.



Wilfred C. Leland, Vice President,  
N. A. C. C.



Hugh Chalmers, Second Vice President,  
N. A. C. C.



H. H. Rice, Second Vice President,  
N. A. C. C.

ers; running board or mounting step; tool compartment; priming coat of lead on all parts to be painted; pair of front lights and one tail lamp; license brackets; warning signal, jack and a set of tools commonly used for making adjustments and minor repairs on the road.

A standard chassis of a commercial vehicle to be propelled by electricity shall

consist of a running gear, motor, battery cradle or box, driving and control mechanism and wiring, with all essential parts, fittings and protective housings thereof, assembled complete ready for operation on the road with the exception of a battery; a priming coat of lead on all parts to be painted; set of tires attached to wheels; pair of front lights and one tail lamp, with necessary wiring installed; license brackets; charging plug and cable; odometer; warning signal and set of tools commonly used for making adjustments and minor repairs on the road.

The object of these definitions is to indicate what minimum parts, finish and equipment constitute the standard chassis for both types of vehicles, and they are expected to simplify the



Col. George Pope, Treasurer,  
N. A. C. C.

compilation of catalogue specifications and the making of quotations by cable, telegraph and letter, and will be of great protection to the buyer in judging values and making purchases.

The members voted unanimously to approve the form of standard service policy to be adopted with reference to the members of the chamber and the purchasers of the vehicles they manufacture, and a stand-

ard repair policy to be operative between the manufacturers and their distributors and dealers. These two policies are the results of the convention of service managers held at Detroit last year, recommendations made by the service managers' associations of Indiana and Michigan, and of two special committees appointed by the chamber, of which Percy Owen and E. T. Klee were chairmen.



R. D. Chapin, Secretary,  
N. A. C. C.

The purpose of the service policy is to provide a definite basis, which will insure that every owner will have fair treatment in the matter of service. The policy applies to motor trucks and delivery wagons, as well as pleasure cars.

One result that the establishment of the policy is expected to obtain is the insurance against misunderstandings that arise through the vague promises of service that are sometimes made by salesmen and dealers, and which are generally verbal. The intention is to print the provisions of the policy in poster form that these can be displayed conspicuously in the sales rooms and service stations of the man-

ufacturers and dealers, which will inform every purchaser just what service he is entitled to, so that the buyers shall have no hesitancy in asking for whatever shall be due to them through the sale.

The policy is reproduced below:

The Blank Motor Car Company, through its dealers, aims to give all purchasers of Blank cars uniformly fair, courteous and business-like treatment, and to assist them in every reasonable way to keep their cars in good running condition.

The principles of this policy are:

First—To fulfill the obligations assumed under the manufacturer's warranty.

Second—To furnish repair parts as promptly as possible at our current prices.

Third—To maintain facilities for making repairs, adjustments



John N. Willys, Director,  
N. A. C. C.



Alfred Reeves, General Manager,  
N. A. C. C.



and do general overhauling in a prompt and competent manner at reasonable charges.

Fourth—To make inspections and adjustments, not necessitated by neglect or abuse, free of charge for one month following delivery of a new car to purchaser, and thereafter at our regular prices.

Fifth—To furnish printed instructions in the operation and care of our cars.

Sixth—Service to be rendered does not include furnishing repair parts or labor without charge, except as provided in the warranty and in the following specific clauses of this service policy:

#### Replacement of Defective Parts.

(a) Within ninety (90) days after delivery of a new car to purchaser the Blank Company will furnish, free of charge at the factory, duplicate parts to replace any parts as covered by our warranty that are returned to the factory with shipping charges prepaid and which are determined by the company to have been defective in material or workmanship, or it will put such parts in condition as good as new without charge.

(b) Within ninety (90) days after delivery of a new car to the purchaser the dealer will install, free of labor charges, any parts that the factory furnishes or repairs free of cost to replace any parts determined by the factory to be defective, the purchaser to assume cost of replacement parts and installation of same pending factory decision.

(c) The party returning the parts will be notified promptly of the decision of the factory regarding allowance of a claim for replacement or repair of parts returned.

#### Inspection and Adjustment.

(d) Cars brought to service stations maintained by factory, branch or dealer, will be inspected and all necessary adjustments will be made as in paragraphs (e) and (f), without charge during the first month after delivery of a new car to purchaser, provided the car has not been tampered with or injured by accident or neglect. After the first month adjustments will be made at the regular charges of the service station.

(e) Inspection includes examination and report of the condition of the car.

(f) Adjustment includes only such adjustments as inspection has found necessary to put the car in good operating condition.

(g) Every dealer is expected to give the same inspection and adjustment service on the cars made by this company without regard to the territory in which they were bought.

#### Repairs, Replacements, Etc.

(h) All work not included in inspection and necessary adjustment during the first month, or installation of replacements under the warranty, will be charged for at regular rates.

(i) When any charge work is to be done and the cost can be estimated in advance, the owner, upon request, will be advised of the amount of the charges before the work is begun.

(j) When it is necessary, for the convenience of the owner, to render service at a distance from the service station, the time spent by employees going to and from the job will be charged for at the regular rates of the station, together with all proper expenses of making the trip, cost of shipping parts, if any, and other necessary incidental expense.

#### Overtime Work.

(k) Any overtime, holiday or Sunday work done upon the request of the owner will be charged for at the regular overtime rate.

#### Instructions in Care and Operation.

(l) Instructions in printed form regarding the care and operation of the car and its accessories, and proper method of ordering and returning parts, will be given to the purchaser upon the delivery of the car.

(m) Personal instruction will be given in accordance with the agreement between dealer and customer at the time of purchase.

#### General.

(n) For service and replacements on engine starters, batteries, magnetos, generators, lamps, carburetors, tires, rims or other trade accessories that are not made by the manufacturer of the car, application may be made direct to the nearest service station maintained by the maker of such accessory. Dealers will be provided with a list giving names and addresses of the manufacturers of said accessories.

(o) No promise of service, free repair work, inspection or adjustment, except as herein specified, given or made by the dealer, shall be binding on the manufacturer of the car.

(p) To help the dealer carry out the intent of this service policy, the owner is requested to furnish all information necessary to the prompt and proper filling of orders and issuing of credits and to observe the requirements regarding return of parts with claims for replacement.

(Signed) THE BLANK MOTOR CAR COMPANY.  
(Address).....

The provisions of the standard parts of policy, which applies to all dealers throughout the country who represent members of the chamber, is as follows:

#### N. A. C. C. Standard Repair Parts Policy.

The purpose of this policy is to place the relations between the Blank Motor Car Company and its dealers on a definite, fair, uniform and businesslike basis.

(1) Stock of Parts—The dealer will be required to maintain a minimum stock of both "current" and "service" parts as specified by manufacturers, to be paid for by the dealer on or before the 20th day of month following delivery.

(2) Censoring of Orders—To prevent the overstocking of inactive parts by the dealer or the purchasing of an excessive stock of any parts, the right is reserved by the manufacturer to reduce in quantity the number of pieces of any part or parts ordered by the dealer.

(3) Inventories—The dealer will be required to furnish an inventory of current and service parts upon request. The manufacturer reserves the right to send an auditor to verify inventories and reduce or increase stock as he sees fit in accordance with clause No. 1.

(4) Shipments to Dealers' Territory—So far as possible the dealer will be required to see that all orders for parts from his territory are placed through him.

(5) Discounts—Discounts to garages or repair shops will be at the discretion of the manufacturer.

(6) Designation of Parts Stocks—Stocks of parts shall be designated as follows:

(a) Current Parts—All parts used in cars of models being produced by the factory.

(b) Service Parts—All parts for models no longer being produced by the factory and which have not been superseded by other parts that are interchangeable with them.

(c) Obsolete Parts—Parts that have been superseded by other parts that are interchangeable with them.

#### (7) Return of Parts—

(a) Defective parts claimed defective under the 90-day warranty must be returned to the factory, with shipping charges prepaid, within 30 days from time defect claimed manifests itself.

(b) Obsolete parts shall be returned only as ordered by manufacturer.

(c) Surplus parts may be returned only by individual arrangement with the manufacturer.

All parts shipped to the manufacturer by dealer shall have transportation charges prepaid and be properly tagged.

(8) Notification of Owner—The manufacturer reserves the right to communicate direct with owners concerning replacement and disposition of parts returned.

(9) Disposition of Returned Parts—The manufacturer reserves the right to dispose, within 30 days, of parts returned, without assuming liability unless covered by shipping instructions or adjustment is accepted.

(10) Parts Purchased or Made Outside of Territory—The manufacturer will refuse to consider claims for or accept for adjustment any parts not supplied by him.

(Signed) THE BLANK MOTOR CAR COMPANY.  
(Address).....

The reports submitted by the constituent companies and the officers to the organization indicated that the automobile industry is now at the height of prosperity, as there are no indications of diminution of demand for pleasure cars and trucks, and the stability of the industry was seemingly established by the statement that a very large number of machines are sold in sections of the country where there are the greatest needs for highway transportation, both individuals and freight.

Statement was made that the shipments of vehicles from the factories to selling agents, as shown by the report of the traffic committee, had greatly increased as compared with previous records. During May more than 24,000 carloads of vehicles were shipped as against 15,392 carloads during the corresponding month of 1915, and that the freight traffic of the railroad is considerably improved was emphasized, as the manufacturers are no longer using flat cars. The traffic department of the chamber had been of material assistance to railroads in relieving the congestion that existed for a number of months. There is reason to believe that there will be better regulation of the traffic.

No change in the standardization of frame widths was made, action on this subject being deferred. The chamber as a body voted to oppose the Tavenner bill now pending before Congress, which would prohibit the use of time studies and premium or premium bonus payments in connection with work for the government done in the factories of the country.

## LONG DISTANCE FREIGHTING.

### Trucks and Trailers Haul Heavy Loads from New York to Hartford, Conn.

Economy of time is often of extreme value, which fact has been very thoroughly demonstrated in these days of seemingly constant railroad congestion and terminal delays, and very frequently a substantial saving can be made by using motor trucks to freight what would be regarded as prohibitive distances. Such an instance impelled the S. K. F. Bearing Company to have 44 tons of bearings shipped to its factory at Hartford, Conn., overland by motor truck rather than have the stock delayed for an indefinite period, which would have resulted had the shipment been made by the New Haven railroad.

The company, which is the outgrowth of a sales organization with headquarters in New York, representing the Aktiebolaget Svenska Kullagerfabriken of



Caravan of Five Mack Trucks and Three Trailers with Which Heavy Haulage Company Hauled 44 Tons of Bearings from New York to Hartford in 29½ Hours.

Sweden, and has established its main offices and a factory at Hartford, because the demand for bearings had increased enormously and these could not be obtained in sufficient volume from abroad. The factory was built and equipped and operations were begun with the arrival of material from Sweden, for the purpose of the company is to produce bearings identical with those made at the Swedish plant. Swedish crucible steel is used for making the bearings, which is maintained to be superior to all other metal, having uniform hardness and a high modulus of elasticity.

To meet its order the company depended upon a shipment of bearings from Sweden, which was received by steamer at New York, but so insistent was the demand that the company could not wait for railroad freightage. On the arrival of the vessel arrangement was made with the Heavy Haulage Company, a New York City haulage contractor, to transport the consignment to Hartford. The shipment was in cases and weighed 44 tons. It was loaded on to five 5½-ton Mack trucks, to three of which trailers were coup-

led, and taken over the highway, a distance of 140 miles. The start was made at 5:30 in the afternoon and delivery was at 11 o'clock the following night, the time being 29½ hours. The distribution of the load on trailers was a precaution taken, as two long detours from the main highway were necessary because of the extremely muddy condition of the roads. The trucks were driven in military convoy formation and the trip was made without a mishap. This is maintained to be the largest truck caravan that has ever left New York for so long a journey. Had the condition of the roads been normal the time could have been considerably reduced.

### BETTENDORF TRAILER COMPANY.

The Bettendorf Trailer Company, which operates at Bettendorf, Ia., and engaged in the manufacture of automobile and motor truck trailers, is capitalized for \$100,000, of which \$50,000 is paid in and the company is, after a long period of experimental work, building trailers and semi-trailers that are claimed to be exceedingly practical and substantial. The company has a well equipped factory and facilities for production on a large scale, and it has already developed a very extensive demand for its products. Besides its distribution in this country a considerable number of orders have been received from Australia, where there is apparently a decided purpose to utilize trailers with both pleasure cars and trucks. The president of the company is J. W. Bettendorf of the Bettendorf company,

and with him are associated as directors Aug. E. Steffen, B. F. Aufdeheide, A. J. Jackson and W. A. Matthey. The activities of the company are directed by A. J. Jackson, who is general manager.

### GERMANY'S PETROLEUM SUPPLY.

Statistics on the petroleum industry of Roumania recently made public disclose the secret of where the Central Allies have been obtaining their oils, as practically 99 per cent. of the exports of this product from that country have gone to Germany, Austria-Hungary, Turkey and Bulgaria. The imports during 1915 were about 380,000 tons of petroleum products.

F. R. Blair & Co., has been organized by F. R. Blair, who resigned as secretary-treasurer and sales manager of the S. K. F. Ball Bearing Company to become its president. The concern will have offices at 30 Church street, New York City, and will specialize efficiency devices.

### ENORMOUS APRIL SHIPMENTS.

With figures for the three final days of the month missing, report was made to the National Automobile Chamber of Commerce that shipments for April amounted to 29,000 car loads, as against 18,912 car loads for the same month of last year.

The car situation was reported to have improved considerably through the efforts of the traffic department of the chamber. The new automobile cars of the eastern roads have been finished and delivered by the car makers in greater number.

At its meeting the chamber passed a resolution opposing the Tavenner bill, which would prevent the government from using stop watch efficiency methods in any of its arsenals or from buying war supplies from any manufacturer who used them in his plant.

### EXPRESS COMPANIES BUY TRUCKS.

Freight embargoes in the New England district have proved a remarkable stimulus to the business of the express companies. The New York, New Haven & Hartford railroad has added 20 exclusive express trains to its schedules and the American Express Company has been forced to add 23 trucks to its service in Boston to make deliveries and collections. The Adams Express Company added 45 horses and has found it necessary to place orders for another similar increase. The April business was said to be the largest in the history of the express companies which operate in New England.

### WANTS HEAVY TRUCK TAX.

The roads of Massachusetts are being broken down by trucks which weigh from four to six tons and carry loads of five or six tons additional, according to Col. W. D. Sohler, chairman of the Massachusetts Highway Commission. He has declared that either the tax on trucks must be increased to provide funds for additional road repairs or a limitation must be placed on the weight of the vehicles. On a stretch of road between Boston and Worcester, where heavy trucks are used a great deal, \$12,000 worth of repairs were necessary, he said, because of the traffic over it.

### SWAMPSCOTT BUYS FIRE TRUCK.

The Swampscott, Mass., fire department has just placed in service a light fire truck, equipped with chemical apparatus and fire alarm repair kit. It is to be used for quick calls and to supplement the work of the two "combinations" already used by the department.

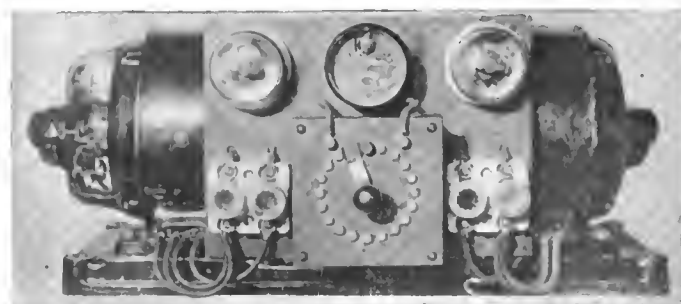
Klieber & Co., builder of Klieber trucks, is building a factory at 11th and Folsom streets, San Francisco, Cal., which will have 50,000 square feet of floor space and cost \$100,000.

### SMALL BATTERY CHARGER.

#### Westinghouse Motor-Generator Lighting and Ignition Equipment.

For charging small storage batteries such as are used in motor cars and motor boats, the Westinghouse Electric and Manufacturing Company, East Pittsburg, Penn., is marketing a small, but complete, equipment. It consists of a simple and compact motor-generator which can be connected to the most commonly found lighting circuits, namely, 110 or 120-volt, 60-cycle alternating current, or 115 volt or 230 volt direct current. The motor-generator takes its power from the line and generates direct current at a voltage slightly higher than that of the battery.

The panel and charging set are supplied completely wired and ready for operation. The motor is connected with the supply line, started by means of a snap switch. The battery is connected to the generator terminals and the ampere charging rate adjusted by means of the field rheostat to the valve shown on the battery plate. As the generator is shunt wound the voltage increases as the ampere rate decreases.



Westinghouse Motor-Generator Set and Rheostat for Charging Ignition and Lighting Batteries.

In other words, as the battery approaches the condition of full charge the potential of the generator automatically rises to the higher value required for finishing the charge. This is important with lead batteries, as the operator may give it a long period low rate charge, which is best for the life of the battery. Snap switches and fuses control both the motor and generator, conforming to all the requirements of the National Board of Fire Underwriters.

### "OLD SAM'S EXPERIENCE."

"Old Sam's Experience" is the title of a booklet containing a fiction story on truck use as compared to horses written by James Edwin Baird, advertising manager of the General Motors Truck Company and illustrated by Felix Schmidt. The booklet tells the experience of a firm which installed trucks in the early days before the machines were perfected, abandoned them and then later found it had to resume using them to meet the competition of other firms in its line.

## MOTOR SHIPMENTS ABROAD.

### No Decrease of Exports with Largest Gain in Trucks.

The latest summary of the Department of Commerce of the country's export business indicate that automobile shipments to foreign countries continue at an unprecedented rate. During March of this year they were nearly double what they were a year ago, 7418 cars being exported in that month, as against 3768 in the same period last year.

For the nine months ending with March, 55,140 motor vehicles were exported, having a value of \$72,900,346, as compared with 17,876, valued at \$28,289,218 during the corresponding period of 1915, and 20,471, valued at \$18,765,656, two years ago. As compared with last year the exports have increased 157 per cent. and 288 per cent. in two years.

The following table gives the export figures for the nine months ending March 31:

Passenger Cars.		Value
	Number	
1914	19,928	\$17,904,002
1915	11,663	9,551,731
1916	38,795	29,261,446
Commercial Vehicles.		Value
	Number	
1914	543	861,654
1915	6,813	18,737,487
1916	16,345	43,638,900

The principal countries to which cars were exported in the last nine months period and the value of shipments in round figures were: United Kingdom, \$22,000,000; Russia in Europe, \$14,400,000; France, \$13,200,000; Asia and other Oceania, \$5,180,000; Australia and New Zealand, \$4,000,000; Canada, \$3,780,000; West Indies and Bermuda, \$2,070,000.

By comparison with exports, the imports of foreign automobiles were almost negligible. During the same period only 772 cars, valued at \$477,412, were imported, and only 71 of these came from France, England and Italy, as compared with 191 a year ago. Most of the remaining 700 probably came from Canada for re-export, as their average value was only \$457, and 462 foreign cars, of an average value of \$565, were exported from the United States.

## REPUBLIC TRUCK OUTPUT.

The Republic Truck Company, Alma, Mich., builder of Republic trucks, is now manufacturing machines at the rate of 35 a day, the production of the four different sizes built depending upon the demands for each type. Statement is made that the intention of the company is to double its present output of trucks within a comparatively short time—probably during the present summer.

The preferred stock of the Goodyear Tire and Rubber Company, Akron, O., has been increased from \$7,000,000 to \$25,000,000, which increases the capital of the company to \$50,000,000.

## CONVERTED FIRE APPARATUS.

### New York Department Will Have 16 More in Service on July 1.

Sixteen additional tractor drawn engines and hook and ladder trucks will be placed in service in the New York City fire department on July 1. Commissioner Adamson, who is a firm believer in the advantages and economy of the motor propelled vehicle for fire fighting purposes, is making the change from horse drawn apparatus gradually, reducing the number of horses in use in the department by 200 each year. There are now 299 pieces of motor driven equipment in use in New York and 803 horses.

In replacing the horses in most instances two-wheel tractors are substituted at a cost of about \$3600 each, the units being used to convert steam fire pumps and ladder trucks. This effects a saving of from \$4500 to \$5000 in each instance, as entirely new motor driven apparatus costs from \$8000 to \$8500 a unit, to say nothing of the total loss through shrinkage in value of the horse drawn vehicles.

An analysis made by the department of the annual cost of maintaining the two kinds of apparatus shows that the horse drawn engine cost \$1287.04, as against \$469.78 for the motor driven.

In taking his stand for motorization the commissioner has also taken into consideration the sanitary conditions existing in the stables, claiming that owing to the presence of horses in the same building with the sleeping quarters of the men their health is endangered.

## TORBENSEN DRIVE PRINCIPLES.

V. V. Torbensen, president of the Torbensen Gear and Axle Company, Cleveland, O., manufacturer of the Torbensen drive system, maintains that there was last year a growth of 400 per cent. in the company's business and that there is every indication of an increase of more than 600 per cent. during 1916.

The Torbensen company has just issued a very interesting pamphlet, entitled, "The Modern Rear Axle for Commercial Vehicles," in which the "Torbensen Drive" is described, giving the details of the Torbensen internal gear axle complete and a discussion of engineering practices in which the principle is used.

E. C. Evans, who was associated with the Packard Motor Car Company, has joined the United Motor Truck Company, Grand Rapids, Mich., as production manager.

The Denneen Motor Company has been organized at Cleveland, O., to build a light motor delivery wagon, and has leased the shops of the Cleveland Railway Company at Coltman road and 123rd street, which will be used for assembling.

# ELECTRIC TRUCKS INVADE MANY FOREIGN LANDS.

By F. NELSON CARLE.

**I**T MAY surprise even the friends of the electric truck to know that storage battery commercial vehicles have already invaded practically all corners of the globe. As a matter of fact, some of our would-be critics may take small comfort from the rapid strides



G. V. Electric Used by a Flour Milling Concern in Johannesburg, South Africa, Climbing a 18 Per Cent. Grade.

made by the electric abroad, for its relatively rapid progress there is in one respect a reflection upon the support given it at home.

For example, there are at present more G. V. electrics in Johannesburg than in Buffalo and Minneapolis combined; more in Manila than in Pittsburg, Lynn, New Haven and Savannah combined; more in Victoria, B. C., than in Milwaukee; more in Melbourne, Australia, than in Atlanta.

Even those close to the industry fail to appreciate often times the tremendous value of the pioneer work done by that handful of patient, half insolvent manufacturers of electric vehicles 12 and 15 years ago. Today the whole industry is reaping the benefit of the lessons learned from the relatively clumsy and inefficient electric trucks which were placed in service years ago, frequently thousands of miles apart. Only the other day an order drifted into our plant for 12 'buses to be used as feeders for a traction line in the West Indies, which was an indirect result of a half successful application of two 24-passenger sight-seeing electric 'buses placed in Callao, Peru, in 1904. There was a perfect epidemic of these American built "rubberneck" wagons about that time and they were bought for South American cities as well as for London and Paris.

## War Helps Electrics in England.

With so many gasoline lorries and practically all horses commandeered for war purposes in Great Britain, the electric truck has found less opposition there in the past two years than it might otherwise

have had to withstand. A large number of General Vehicle, Baker and G. M. C. electrics have been sold in and around London since the war started and the demand is really greater than that indicated by the sales, because even the electricity supply companies, as the central stations are called, cannot make purchases of new equipment except out of surplus funds without the consent of the Board of Trade. This august body still frowns, too, upon mercantile corporations issuing bonds against expansion which would involve motor delivery equipment, particularly of foreign manufacture, except in isolated cases.

The Midland Railway of England has made extensive purchases of heavy duty electric trucks for tail-board delivery and the industrial truck, or "electric stevedore," has also found favor with railroads and marine terminals. The cartage concerns have begun to buy and there is considerable activity in the municipal field as well.

There are many economic reasons why the electric is now making headway in conservative London, among them the dearth of skilled drivers, the almost prohibitive price of petrol and the awakening of the central stations to the possibilities of the sale of current for charging, and so on.

Those who rail at the variation in prices charged for current in America should operate an electric truck in London and they would soon cease to criticise their home land, for there each little municipality or individual lighting company has a different rate and one may pay seven different rates for charging in as many sections of London alone.

## Progress in South Africa.

Cape Town and Johannesburg have both taken kindly to the commercial electric, with the latter city



G. V. 3 1/2-Ton Truck Chassis Equipped for Street Sprinkling, Used in a London Suburb.



leading in the variety of trades served. Three gold mines near Johannesburg, one of them the largest in the world, now use heavy duty electrics, with flour mills, coal dealers and wholesale grocers trailing the wealthy mine owners. Three trucks is about as many as you will see used by one concern, but one truck a year from a number of concerns in several cities soon counts up.

One of the Cape railroads has a fleet of nearly 20 trucks, which have already reduced tailboard costs materially. With cheap electricity, unskilled labor for drivers (often natives) to contend with, the ox and gasoline lorry are at a disadvantage in the cities at least.

#### Australia Converted, Too.

Melbourne and Sydney have followed in the foot-

per cent. grade to send it along, getting a check from their New York bankers. This we did, and the truck had only been in service a week when a cable came in for a new motor. The buyer cheerfully omitted to state the length of the eight per cent. grade, which as it turned out involved a hill three miles long.

#### Nearly 100 in Manila.

The United States War Department and the Manila Electric Railway and Light Company alone operate over 60 electric trucks in the Philippines and a number of merchants, transfer companies and central stations have bought about 30 more. Native drivers are used almost exclusively even on the war department trucks and unless there has been a change within the last two years, the foremen and helpers in the three electric garages in Manila are also natives.



Electric Trucks in Service in Foreign Lands: 7, One of 30 G. V. Electric Trucks Operated by the United States War Department at Manila, P. I.; 8, Some of a Fleet of Electrics Making Tailboard Delivery from London Railroad Terminals; 9, G. V. Electric Truck Used at a South African Gold Mine; 10, a 10-Foot Freight Truck in the Service of the London and South-western Railroad in England; 11, One of the G. V. Electric Trucks Used for Emergency Red Cross Transportation in England, This Being Freight with Wounded Soldiers Going from a Railroad Station to a Hospital; 12, a G. V. Truck with Which Ice Is Delivered from a Congealing Plant in the Transvaal, South Africa; 13, Fleet of Nine Trucks Making Delivery for a Railroad at Cape Town, South Africa, These Bring Laden with Grain in Bags; 14, Electric Tank Wagons Used by the Department of Cold Storage at Manila, P. I., to Distribute Distilled Water; 15, the Second Electric Truck Sold in Cuba, Delivered in Havana in 1908.

steps of Cape Town and adopted electric trucks for merchandise transportation as well as for steam railroad trucking. The electric industrial truck has proven a revelation in some of the freight terminals in Sydney and one of the big dry goods stores in Melbourne has reordered several times. Until the General Vehicle Company had agents on the ground, some amusing misunderstandings between manufacturer and buyer occurred and this experience is probably common to many exporters. A milling company said in substance that if a five-ton truck could climb an eight

In the majority of cases chassis only are shipped, and as good lumber is very expensive and the native woods difficult to work up to anything resembling good body material, some of the bodies placed on the electric in that part of the world are worth walking quite a distance to see.

As will be noted from some of the illustrations, electric trucks have also reached China, Japan, Siam and other far eastern countries. There are one or two in Bombay, but the writer believes they are of English or local manufacture.

**Alaska, Cuba and Brazil.**

The high cost of gasoline is quite a factor in retarding motor trucks sales in many lands and in Alaska,



**Baker Electric Truck in Service of Central Station at Bangkok, Siam, Carrying a Construction Crew, and Driven by a Bare-footed Native.**

ka, where it now averages never less than \$1.25 per gallon, few trucks of any kind are sold. At least two mining concerns in the Klondyke use electric trucks, however, and the intense cold does not appear to materially reduce their efficiency. As a matter of fact any motor truck which will stand the intense winter cold of the Dakotas and Canadian prairie cities will get over the road in Alaska if there is any road there, at least so far as zero weather is concerned. Of course practical snow shoes for motor trucks are not yet in evidence.

In Cuba, Porto Rico, Mexico, Argentine, Norway and New Zealand the electric truck has just begun to make itself known. In Brazil about 30 have been in service from four to eight years and the cities of Rio De Janeiro and Buenos Aires will offer unusually fine markets when properly developed. As is the case in American cities, however, it is not the long life and efficiency of the truck which is taken into consideration by the buyer of the initial truck so much as first cost, and the electric must make its way solely on sheer merit. Once it gets its foot in the door, however, it usually causes business men to reconstruct their ideas of efficiency and economy.

**A Matter of Evolution.**

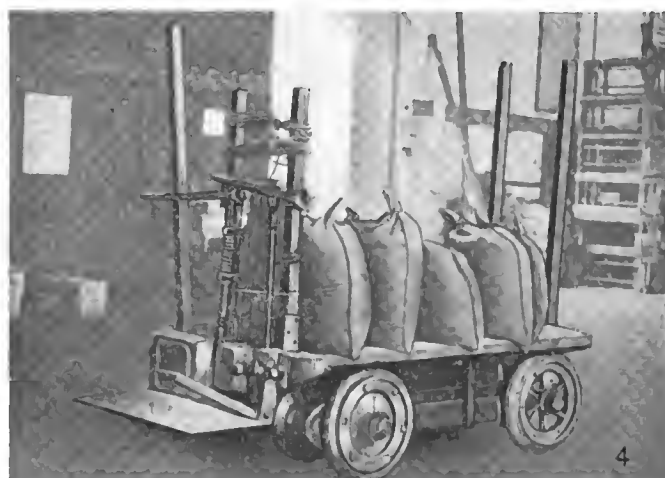
The automobile trade in general still hugs so many unfair ideas about the electric close to its heart that any progress report such as this is liable to be taken by some as confirming inherent weaknesses if not in the vehicle itself, then in the methods used in its distribution. In granting that economic conditions have aided the electric in many cities, the writer is not apologizing or citing any electric truck handicap, but is rather trying to show a broadening recognition of the advantages of electric trucking in the field of this powerful road transportation unit.

It is all a matter of evolution and experience. It ill becomes any motor truck manufacturer to question the business judgment of the buyer, but it is very ap-

parent to most of us that just as the manufacturer has progressed from point to point in producing a better vehicle, so the user almost invariably reaches, in the course of time, a better understanding of the relative merits of different delivery units. In the end it shakes down to a question of adaptability to his particular business. He can utilize any one of several combinations and still beat the all-horse delivery system. He can make an absolute failure of the best made trucks and these adapted in capacity to his needs, but if he will exercise the same care in the selection and efficient operation of motor delivery vehicle, or a fleet of same, as he does in the selection and care of expensive plant machinery, he will get somewhere and he will save money.

It does not worry the manufacturers of electric trucks that their vehicles are sometimes purchased only after the operator has tried out about every other combination for delivering goods; it rather pleases them, for they see in the operator's decision that he has reached the enviable basis of going at the matter scientifically and deciding to build up with patience and discrimination a delivery system as near 100 per cent. right as operating conditions and the human element can make it.

One very interesting phase of electric truck sales in foreign cities should be noted: Operators of often the first half dozen trucks in a town, thousands and thousands of miles from a place where they can quickly get a duplicate of the storage battery supplied, seem to get along all right under what many would think were great handicaps. The writer believes this to be due to a higher respect for good machinery and a tendency to be thorough in their care of it. We cannot assume that they have a better knowledge of electrical apparatus than we have, so that old-fashioned thoroughness, which we so often confuse with slowness, really has a dollars and cents value in the operation of motor trucks.



**G. V. Electric Industrial Truck Loaded with Salt, Used at One of the Railroad Terminals in New South Wales, Australia.**

Speed has its price in about every field of endeavor and whether we take the side of the man who builds an automobile so that its conservative owners can get

20 years of faithful service from it, or that of the manufacturer who has something to sell and indirectly encourages the scrapping idea, as well as the new model, we must admit that as a cold-blooded business proposition efficiency is either worth while or it is not.

### SEAMLESS STEEL BODIES FOR FORDS.

The Stover Steel Tank Company, Freeport, Ill., is building seamless all-steel commercial bodies for use on Ford chassis. These are made in any size desired up to 12 feet three inches long and any thickness up to  $\frac{3}{8}$ -inch boiler plate. All-steel stake bodies are also built, which vary greatly in dimensions, to meet the requirements of various businesses. These bodies are claimed to outlast wooden bodies six times, and as they are constantly in service there are no delays for repairs.

Commercial bodies for Ford chassis are made in one piece without riveted seams, which results in their being noiseless as well as far more substantial than the average wood body. The company began building these bodies but recently, after long study and experimentation had developed machinery for their construction. The company is the first in the field. The bodies cost about the same as those made of wood.

### "THE GASOLINE AUTOMOBILE."

An exceedingly instructive book is "The Gasoline Automobile," by George W. Hobbs, B. S., instructor of mechanical engineering in the University Extension Division of the University of Wisconsin, and Ben G. Elliott, M. E., associate professor of mechanical engineering in the University of Nebraska, the first edition of which has been published by the McGraw-Hill Book Company, Inc., 239 West 39th street, New York City.

The book is intended for the instruction of those who desire to obtain practical knowledge of motor vehicle design and construction, such as owners and drivers who require substantial information, as free from technicalities as is possible, and it deals with a large number of instances of present day practise. The book contains 253 pages, is profusely illustrated and has many charts and diagrams relevant to the contents.

It is divided into 10 chapters, which respectively consider general construction, engines, power plant groups and transmission systems, fuels and carbureting systems, lubrication and cooling, batteries and battery ignition, magnetos and magneto ignition, starting and lighting systems, automobile troubles and remedies and operation and care. All of these subjects are thoroughly reviewed with reference to vehicles that are in general use and they are carefully indexed. The book will serve an exceedingly useful purpose for the person who desires authentic and practical information.

### WHITE COMPANY PROFITS.

The net profits of the White Motor Company for the year ending Dec. 31, 1915, were \$9,774,000, equal to 54.3 per cent. on the \$18,000,000 capital stock of the company. In 1915 the company turned out 8100 vehicles. The current assets of Dec. 31, 1915, consisting of inventories, accounts receivable and cash, totalled \$9,137,046.

### SULLIVAN JOINS FISK COMPANY.

Growth of the Fisk Rubber Company has led to an extensive reorganization of its advertising department. George L. Sullivan, recently associated with Bromfield & Field, Inc., a New York advertising agency, is now advertising manager. Miss M. G. Webber, who supervised Fisk advertising in the past, and George B. Hendrick, in charge of its publicity, are assistants to Mr. Sullivan.

Mr. Sullivan is widely experienced in business and advertising. He was connected with the Boston Woven Hose and Rubber Company in the sale of Vim bicycle tires. Later he became advertising and sales manager of the Daniels & Fisher stores of Denver, Col., the largest department store west of the Mississippi river. He was later connected with the



George L. Sullivan, Advertising Manager, Fisk Rubber Company.

Cheltenham Advertising Agency. For three years he was with the American Locomotive Company, first as advertising manager, then in the establishment of agencies and supervisor of branches, and later as manager of the branch at Chicago.

### TOTAL PETROLEUM SUPPLIES.

The Federal Trade Commission, which employed field experts to determine the status of the country's petroleum supplies, will soon report to Congress that according to its findings the petroleum deposits of the United States are more than 30 per cent. exhausted and that the remaining deposits will not last 30 years.

The United States is now producing 60 per cent. of the world's supply, and of this amount 20 per cent. goes for export and 25 per cent. is used for fuel oil in boilers.

## URGE CENTRAL STATIONS TO PROMOTE TRUCK USE.

**National Electric Light Association Convention Speakers Show That Great Opportunity for Industry Is in the Public Service the Companies Can Give.**

**M**EETING for the first time since affiliation with the National Electric Light Association as an integral part of that body, the Electric Vehicle Section, formerly the Electric Vehicle Association of America, demonstrated at the Chicago convention, held May 22-26, that it will be a very active and influential body, and that it will receive a decided measure of co-operation in its endeavors to promote the use of electric vehicles of all types and classes.

### From 5000 to 6000 Delegates.

The convention at Chicago was attended by between 5000 and 6000 delegates, which is a very convincing demonstration of the magnitude of the electric light, heat and power industry, and of the influence which so large and so completely organized an association may have, even among those of a nation of mammoth enterprises. The presence of hundreds of delegates, all enthusiastic of electric vehicles, and all of them intensely concerned in educating the representatives of the central stations to the practical possibilities of these machines, could but have a pronounced influence.

Not only was the convention by far the largest that has ever been held by the National Electric Light Association, but there was in connection with it in the foyer of the Auditorium theatre an exceptionally interesting display of electrical utilities, in which electric vehicles were decidedly conspicuous. The prominence of the Electric Vehicle Section was impressed upon all visitors and the sessions were exceedingly well attended. One of the results of the convention was the adoption of a new constitution and by-laws for the government of the section, which was desirable because of the changed condition, and a new board of officers was elected whose term of office and manner of administration will be in accordance with the provisions thereof. There was no important change in the personnel of the executive officers, so that the policy that was followed by the Electric Vehicle Association will



E. S. Mansfield, Boston, Vice Chairman Electric Vehicle Section, N. E. L. A.

be continued practically without change.

There is undoubtedly great confidence in the future of the electric vehicle as a means of highway transportation, and the earnest interest of the officers of the association was abundantly evidenced by the president urging that during the coming year each central station purchase at least one electric wagon for its own use and publicly demonstrate the practical possibilities of these machines in the different communities in which the stations are established.

### Individuality of Sections Retained.

The electric vehicle interests did not lose their individuality by the merger of the two associations, and there appears to be no reason why there should not

be a very material progression, because there is unanimity of purpose and well organized endeavor, and reasonable assurance of co-operation in whatever will promote the use of electric transportation units.

Because of the great number of delegates to the convention the sessions were not general, but were divided into meetings of sections, there being 22 sectional gatherings, of which three were devoted to the electric vehicle section. These were carefully arranged, the first being devoted to business and the last

two very largely to papers and discussions. The proceedings of the convention, so far as relate to the electric vehicle section, are dealt with in the following, with excerpts from the various reports and papers:

### THE OPENING SESSION.

The first session of the convention was presided over by Chairman Walter H. Johnson of Philadelphia, and during his address the chair was filled by Vice Chairman E. S. Mansfield of Boston, who was later elected chairman for the year to come.

### SECRETARY'S ANNUAL REPORT.

The annual report of Secretary A. Jackson Marshall of the Electric Vehicle Association, covering the seven months' existence of the association prior to affiliation, and which reviewed the events that led to the merger, was next presented. This stated that the 1128 members of the Electric Vehicle Association were transferred to membership in the National Electric Light



A. Jackson Marshall, Secretary, Electric Vehicle Section, N. E. L. A.

Association, and that as quickly as the affairs of the former organization could be disposed of the body would be permanently dissolved. The delay was necessary because the Electric Vehicle Association is incorporated and legal formalities must be observed. Meantime, the activities are continued as the Electric Vehicle Section of the National Electric Light Association.

During the time intervening between the receipt of the invitation to affiliate and the acceptance of the invitation, the association was more or less passive, and the active development for the time ceased. The membership as of Oct. 1, 1915, was made up of 110 central stations, 27 manufacturers, 921 associate, 13 auxiliary and 30 press, making a total of 1101, and April 15 the membership consisted of 110 central stations, 33 manufacturers, 951 associate, seven auxiliary and 27 press, a total of 1128. Of this membership 1084 are in the United States and 44 in foreign countries, of which 18 are in Canada, nine in England, five in Australia, three each in British Columbia and New Zealand, and one each in Brazil, Denmark, Germany, Philippine Islands, Scotland and South Africa. There was, of the total membership of the Electric Vehicle Association, 948 who were not associated with the National Electric Light Association.

The report dealt with the distribution of sales prospects received to the members, to the knowledge of market conditions abroad obtained by correspondence with representatives in practically all civilized countries, with official garage or charging station signs that may be supplied by the association, to uniform accident reports, the activities of the employment bureau, the value of the data accumulated and available for the members and other subjects.

#### NEW CONSTITUTION.

After the report of the treasurer and the reading of brief reports of the activities of the 17 different sections of the association, Chairman Frank W. Freuauß of the constitutional revision committee made report of the revised constitution, which report was accepted and the constitution adopted.

After defining the name of the organization as the Electric Vehicle Association of the National Electric Light Association, and the object the dissemination of knowledge in regard to, and the adoption of the use of, electric vehicles for business and pleasure purposes, the membership is divided into active, auxiliary, press and associate. Of these the active membership only shall have the right to vote. The active members shall be manufacturers and distributors of electric vehicles, batteries, motors, tires, central stations or holding companies; the auxiliary members shall be manufacturers or distributors of electric vehicle accessories; the press members shall be publishers of newspapers or magazines; the associate members shall be employees or representatives of active, auxiliary or press members, those owning or operating electric vehicles or garages using central station service, or persons not eligible as either of the three other classifications. Firms and corporations having associate membership may designate an official representative. No person not a member of the National Electric Light Association shall be eligible to membership. The active membership due of manufacturers of



Arthur Williams, New York, Member Executive Committee for Three Years.

electric vehicles or batteries ranges from \$100 to \$250 a year, dependent upon the volume of business done; of central stations from \$10 to \$350 a year; of holding companies \$150 a year; of manufacturers or distributors of electric vehicle motors and tires \$100 a year; the due of auxiliary members \$25 a year; of press members \$10 a year; of associate members \$5 a year.

The officers of the association are designated as chairman, vice chairman, secretary and treasurer, to be selected at the annual meetings and hold office for a year. The chairman shall be ex-officio a member of the executive committee. The executive committee shall consist of the chairman, vice chairman, secretary and treasurer, the associate vice chairmen equal to the number of organized sections and 12 others. At the first meeting four members of the executive committee shall be elected for three years, four for two years and four for one year, and thereafter four members shall be elected annually, to serve for three years. The executive committee shall be the governing board of the section and have entire charge of its affairs. The meetings shall be held at the call of the chairman and five members shall be a quorum. The chairman, with the approval of the executive committee, shall name such committees as may appear desirable and appoint

the members thereof. The terms of the committees shall terminate with the terms of the officers, unless sooner terminated by the executive committee. The treasurer is required to make quarterly report to the executive committee and annual report at the annual meeting of the section. The secretary shall perform such regular duties and special duties as may be assigned to him by the executive committee.

Local sections may be organized in any locality where a membership of 15 petition the executive committee for the right to organize, and while subscribing to the constitution, may also make such special rules and regulations for its government as the members may elect, subject, however, to the approval of the executive committee. No local section shall incur any expense that shall be chargeable to the Electric Vehicle Section without first receiving the approval of the executive committee, and each local section shall forward to the secretary copies of papers and discussions presented at the meetings, which shall be available for use of the Electric Vehicle Section, by the executive committee or by the other local sections. The annual meetings shall be held at the time and place of the national convention of the National Electric Light Association, and special meetings may be held at the order of the executive committee. At meetings of the section 10 shall constitute a quorum for the transaction of business.

The executive committee shall select a nominating committee of five, which shall be announced at the first annual meeting, which committee at a subsequent meeting of the executive committee submit a list of names for those recommended by it for the offices to be filled. Any accredited representative of an active member may make nominations for any of the offices to be filled, which nominations, if seconded, shall be submitted for voting upon at the same time and in the same manner as those of the nominating committee. In the event of more nominations than there are offices to be filled the election shall be by ballot. Voting by proxy is not allowed. Amendments to the by-laws may be offered in writing at any meeting of the section and shall be referred, before being acted upon, to a committee selected by the section. A two-thirds vote of all accredited members present shall be necessary for the adoption of and such amendments must be approved by the executive committee of the National Electric Light Association.

#### THE MEMBERSHIP.

The report of the membership committee was presented by Chairman Joseph D. Israel, which stated that no organized effort to increase the membership has been made for the past six or seven months, because the committee was awaiting a definite ruling relative to the status of the committee under the affiliation, but a number of new members had been received. The growth of the association from Oct. 1, 1915, to April 15, 1916, was 27, the total the last given date being 1128.

#### MOTION PICTURE FILM COMMITTEE.

In the absence of Chairman Carl H. Read the report of the motion picture committee was read by Secretary Marshall. This related to the uses made of the picture film showing "Selling Electric Vehicles." The committee has two films, both of which are for the use of the different sections, and have been exhibited at some section meetings, and are available for other organizations that may wish to use them.

#### REPORT ON STANDARDIZATION.

The report of the committee on standardization was made by Chairman E. R.



Frank W. Smith, New York, Member Executive Committee for Three Years.



Whitney and this included a statement that the committee had co-operated and assisted the Electric Vehicle Division of the Society of Automobile Engineers, the personnel of the committee and division being largely of the same men. Standardization of two sizes of charging plugs and receptacles, motor voltage, motor name plates and the number of cells in standard battery equipment had been effected. Included in the third annual report of the Society of Automobile Engineers was a series of recommendations which were in substance that electric vehicle speed ratings shall be based on continuous operation with one-half load over hard, smooth and level roads at the actual average battery voltage; that electric vehicle mileage ratings shall be based on continuous runs at the S. A. E. rated speeds with one-half load over hard, smooth and level roads or pavements.

The committee made recommendation that standardization of battery jars for lead batteries be adopted. The S. A. E. committee is now preparing a list of standard jar sizes that is hoped will eliminate approximately half the present number of jars and just as satisfactorily take care of any make of battery and with any type of plate; also that the S. A. E. committee has carefully considered the efficiency test of solid tires and had twice submitted recommendation covering the rebound method of testing solid tires for efficiency. The committee's report had not been adopted, principally because of the lack of familiarity with the method recommended. The committee is now considering standardization a line of circular duplex charging cable, this being taken up to arrive at a uniform outside diameter and provide for clamping the cable mechanically where it enters the charging plug, and with a view of eliminating a number of types and sizes of cable now used. The committee has tentatively agreed upon a line of cable to consist of the following equivalent sizes: B. & S. Nos. 6, 4, 2, 1 and 0. Other subjects are being considered, but sufficient progress had not been made to justify report.

#### GREATER GARAGE SERVICE.

"Greater Garage Service" was the title of the first paper, which was read by Harry Salvat of the Fashion Garage, Chicago, which was in effect an appeal to the need of greater co-operation between the manufacturers of electric cars and the garage owners. He maintained that there was a feeling of toleration on the part of some owners of garages toward electric vehicles, which he attributed to the fact that the manufacturers were not making effort to cultivate and obtain the co-operation of the garage men. He believed this was due in large part to the attitude of the representatives of the manufacturers.

Following this paper there was a reply from the viewpoint of the manufacturers, made by Gall Reed of the Walker Vehicle Company.

Chairman Johnson appointed Joseph D. Israel, G. A. Freeman, Walter Neumuller, P. D. Wagoner and Frank W.



Charles Bilzard, Philadelphia, Member Executive Committee for Two Years.

Smith as a nominating committee.

#### THE SECOND SESSION.

At the opening of the second session a report was submitted by W. A. Manwaring for the Traffic and Good Roads Committee in the absence of Chairman A. H. Manwaring.

#### COMMITTEE ON INSURANCE.

The report of the insurance committee was presented by Secretary Marshall in the absence of Chairman Day Baker and set forth that the activities of the committee had been limited by the late appointment of its members; that previous committees had collected considerable data on number of accidents and fire losses on electric vehicle risks, which data was of such nature that preferential rates for electric vehicle risks had been secured from many of the large insurance companies. Because of an apparent lack of interest in insurance during the past two years, some of these



F. W. Fruenau, New York, Member Executive Committee for Two Years.

companies have cancelled the preferential rates established.

The committee emphasized the fact that owners of electric machines do not take advantage of the conditions created by the committees of the association, and with reference to insurance apparently place their insurance with their regular brokers, without giving special instructions that the policies on electric vehicles and garages be written with such companies as have made the association preferential rates. This neglect nullifies the work of the committee.

#### NEW LEGISLATION.

The committee on legislation, through Chairman P. D. Wagoner, made report of the new and important laws that had been enacted up to the time of the preparation of the summary, in the different states of the country, as well as bills that were pending. These statutes were outlined with a view of bringing to the attention of the members the conditions that might affect the sale and use of motor vehicles. The purposes of the laws were briefly stated and in addition to these other legislation that might have bearing on the automobile trade in the states of this country, and in England, was summarized. No recommendations were made by the committee.

#### RELATION OF TIRES TO EFFICIENCY OF ELECTRIC VEHICLES.

"The Relation of Tires to Efficiency of Electric Vehicles" was the title of a paper presented by S. V. Norton, manager of truck tire sales for the B. F. Goodrich Company, Akron, O., in which a definition of efficiency as applied to tires was made. The subject was divided into two heads, the one treating of electric pleasure cars and the other of electric wagons and trucks, and after considering what constitutes efficiency in each of the two types of tires the address turned to manufacturing processes by which this efficiency was obtained. With the pleasure car the requirements are in order of importance comfort, safety, low cost and speed. With the business vehicle the essentials in the same order are carrying capacity, low cost of operation, reliability and speed. Under the head of pleasure car tires the cushion and pneumatic types were reviewed and statement made that the whole problem of gaining resilience in a pneumatic tire was in producing a casing that was as flexible and yielding as possible, consistent with strength.

Turning to the requirements for commercial vehicles as these effect efficiency, comfort was no longer a primary consideration, this being replaced by capacity; the quality of safety or reliability is maintained, but with emphasis upon reliability, safety being taken as more or less for granted; low cost of operation appears with added importance since the vehicle is operated for profit only, while speed is also a factor, but owing to the limited speed of the electric this is not of great importance.

The pneumatic tire is used on but a small proportion of electric trucks, for, with comfort no longer a serious consideration, reliability and low cost of opera-

tion appear to be the determining factors. They can hardly be rated as fair in point of reliability because of the relative heavy weights that must be carried and they must often be operated on highways that are unfavorable to tire endurance.

In respect to low cost of operation, also, pneumatic tires can only be considered fair. While they are favorable to the upkeep of the machine and efficient in current consumption, they do not compare with the solid tire in length of service. With respect to speed pneumatic tires are, of course, highly efficient. However, as the electric truck is not driven with the great hursts of speed that are characteristic of small gasoline trucks, and which alone is the reason for the use of pneumatic tires on them, the question of equipping electric trucks with pneumatic tires becomes, with respect to speed, a matter of indifference, in which reliability and low cost become ruling considerations.

The cushion type solid tires are used to some extent on electric trucks. In point of capacity they are limited; the use of a stiffer compound that is used in pleasure vehicle service is necessary, and a limit is reached beyond which even this fails to be of service. In point of reliability they are more efficient than the pneumatic, but here they are limited at most to trucks of medium weight. Their "gingerbread" construction makes them peculiarly vulnerable to the punishment of the road and under compression of heavy loads the treads spread laterally, and in this unprotected shape are liable to be lopped off by sharp objects in the streets, especially car tracks.

In point of reliability the cushion tire cannot be rated much higher than the pneumatic. Respecting low cost of operation, the cushion type can be rated as only fair, its first cost is rather higher, and except on very light trucks it is short lived. It is fairly efficient as regards current consumption, and also in its effect on the upkeep of the truck. As to speed, it lies half way between the pneumatic and the solid tire, but as indicated above, the whole matter of speed of electric trucks is contained within such a moderate compass that variations one way or the other are not of great commercial importance.

The regular steel base solid tire undoubtedly represents the most efficient equipment for the electric commercial vehicle. In point of carrying capacity or strength it affords all that has been asked for by the industry. In reliability it is ideal. It is immune from sudden failure, such as puncture or blow out, and by reason of its solid profile is proof against street conditions that might cause trouble to a weaker tire. Because of its steel base construction and its steel to steel application to the wheel, its reliability is further increased by disposing of the danger of the tire suddenly coming off the wheel, which not infrequently happens with special lighter tires of canvas base or side wire construction.

As affecting low cost it is very ef-



James H. McGraw, New York, Member Executive Committee for One Year.

ficient. It is moderate in first cost and generally delivers a mileage far in excess of any other type under similar conditions. In current consumption it does very well indeed. In this connection it must be recollected that the relatively soft solid tire used on light pleasure vehicles would not by any means prove efficient on heavy trucks, even assuming that it would stand up. Such a tire, while yielding to road obstruction, would flatten out and "drag," thereby consuming more current than less. As affecting upkeep of the vehicle, it is fairly efficient. In the matter of speed the same considerations apply as with the cushion and pneumatic types. It is not desirable that heavy trucks should travel at high rates of speed. Within the limits imposed by law, traffic and the motive power of the electric truck, the solid tire performs satisfactorily.

It is pertinent to note that electric vehicle manufacturers have pretty generally laid emphasis on the relation of



Horace W. Suydam, Toledo, O., Member Executive Committee for One Year.

tires to current consumption. With the electric vehicle perhaps the most prominent consideration so far has been the cost of current or the distance which it is possible to go on one battery charge. Manufacturers have been inclined to favor, and not without reason, that tire which consumes the smallest amount of current per mile of travel. It is true they have given careful consideration to the other factors that make for an efficient electric vehicle, comfort, safety or reliability, carrying capacity, speed, upkeep, durability, etc. These qualities, however, do not readily lend themselves to evaluation by test, and are found in practise by observation and experience.

What qualities in a tire make for low current consumption? It is a most baffling question. No one has as yet been able to give a complete and accurate answer. The condition nearest to the ideal with respect to rolling friction is found in the locomotive wheel on the steel rail. The resistance encountered by steel wheels rolling on heavy, clean rails, is about three pounds per ton carried. If all our roads were as smooth and hard as steel rails, all our vehicles would have steel tires. Under such conditions, solid tires of the very stiffest and hardest compound would consume less current than pneumatics.

Unfortunately, however, road surfaces possess innumerable humps and depressions of every kind, which the vehicle wheels must pass over. A hump in the surface of a road is nothing more or less than a little hill which the truck has to climb before it can get over. Both the hard and the soft tire must climb the hill. The very hard tire climbs the whole distance, but the soft tire surmounts the obstruction by climbing, let us say, half the height, and the other half it absorbs by indentation into its resilient and efficient tread. This does not amount to much in the case of one or two humps in a road. A truck, however, in the course of a day's run may, and probably does, encounter many thousands of these local irregularities, and at the conclusion of the day's service it may be figured that the very hard tire has caused the truck to lift its own weight possibly a total of more than 100 feet higher than the soft tire. Softness, therefore, seems to be a requisite of low current consumption.

How soft or yielding should tire be? This depends upon several factors—there are conditions in which a harder tire consumes less current than a softer one. The tire can be too soft and "drag," consuming an excessive amount of current. Is mere softness enough? Decidedly not. Consider how much effort it takes to walk over soggy ground, or over soft sand. The footing yields and consumes most of the energy of the walker without giving it back. It is much easier to walk over dry and springy turf; or in leather shoes rather than shoes of heavy felt. In this quality of springiness or "kick-back" we find perhaps the most authentic indication of efficiency from the point of view of current consumption.

Mr. Norton then took up the different

tests made of both solid and pneumatic tires, including road, grade, coasting, impression, scierscope, yield and dynamometer, briefly outlining each and how the results obtained are applied, and stated that the tests used to determine tire efficiency were at present inadequate. This conclusion could hardly be otherwise because of the many variables which influence the conditions of any test. Tests made inside the laboratory are more subject to question than those in which attempt is made to reproduce actual operating conditions. The road test seems to be the most convincing if made under average and not ideal conditions.

His conclusion was that decision as to what type or what tire should be used on an electric vehicle could not be made without declaring what value should be placed on comfort, reliability, safety, carrying capacity, speed and the lowest cost of operation. These qualities, fully developed, cannot be obtained in any one tire. As one quality is valued more highly than another, choice must be made.

#### FEDERAL AND MUNICIPAL TRANSPORTATION.

After briefly considering the possibilities for promoting the sale of electric vehicles because of the united influences of the central stations and manufacturers, which can be directed in practically every community of importance in the nation (which is the logical prospect from the merging of the two associations), the report of the committee on Federal and Municipal Transportation, which was presented by Chairman James H. McGraw, pointed out that no plan comprehending the broadest introduction and development of the electric could omit consideration of the part to be played by the central stations in exploiting vehicle sales, as well as sponsoring the subsequent operation of the electric machines in service.

#### INDUSTRIAL TRUCK USES.

The paper by C. W. Squires, Jr., of the western branch of the General Vehicle Company, on "Industrial Truck Applications," dealt with the uses of electric trucks in industrial establishments, this showing the economical possibilities in differing industries, in manufacturing establishments, in railroad and shipping terminals, and for many purposes for which only labor could be used, and in which the saving of time and number of men employed was very large.

#### ELIMINATING ELECTRIC TRUCK TROUBLES.

The closing paper of the second session was on "Electric Truck Troubles and How to Eliminate Them," by F. E. Whitney of the Commercial Truck Company of America of Philadelphia, which, in the absence of Mr. Whitney, was read by J. R. Freeman.

The writer stated that because of his association with the manufacturing division of the industry rather than considering differences of design and improvement of one design as compared with another, he had endeavored to bring out points in connection with the elements that go to make up the complete vehicles—batteries, motors, controllers, wiring, wheels, springs, bearings, etc., where troubles have been met and improvements made, so that the manufacturers have reduced weight, increased mileage range and lessened power consumption and

maintenance cost. With reference to the care and upkeep cost of batteries, which was questioned by those not informed as to battery maintenance, as well as the matter of dependability in service, and which question is the result of difficulties experienced by the small user principally in the care of vehicles, due to lack of expert knowledge and battery frailty, Mr. Whitney stated that radical improvements had been made in the make up of batteries. That real progress had been made toward standardization of battery jars, which will greatly reduce the number of sizes and simplify the work of the repair men, obviating the trouble experienced by owners having batteries of different makes having to use different sizes and shapes of battery jars for batteries with the same number of plates and rated capacities, was assured. Some lead battery manufacturers will now guarantee to the user that their batteries need not be dismantled until the plates are exhausted, assuring sufficient plate life to make the



I. D. Wagoner, New York, President General Vehicle Company, Member Executive Committee for Three Years.

battery cost well within reasonable limits. With improvements made in nickel-iron-alkaline batteries, the user can today select a battery suited to his needs and be able to obtain reasonable service.

He noted that batteries are now generally connected permanently in series, instead of being split into series parallel combinations, this obviating trouble arising from the last mentioned practice by an occasional cell being missing or an open circuit in one battery section causing unequal discharge, and other complications resulting from different parts of batteries not being in a uniform state of charge. The greatest benefit in battery development was reduction in weight, which had been obtained by practically all battery manufacturers. There had also been progress made in preventing stoppage of electrolyte and providing means to more easily flush the batteries. A plan that is meeting with much favor, and which will overcome the largest obstacle to the satisfactory adoption of electric vehicles, is a service system with which the user can obtain from either a garage, central station or representative of a vehicle company or battery company, an agreement to keep the battery on a definite upkeep basis.

The development of the ampere-hour meter, which indicates accurately the condition of charge and discharge of the battery, is reasonably dependable, and is of material assistance to the one charging the battery, has been one of the largest single items of benefit to the electric vehicle user. With regard to tires, the standardization of wheel dimensions has obviated all need of changing wheels to

meet variances in tire sizes, so that any make of tire can be used on one set of wheels, and the manufacturer can carry a stock of wheels with assurance that they will serve with practically any equipment. The guarantee of tires has been increased from 90 days, which was the maximum a few years ago, to from 8000 to 10,000 miles, extending over 18 months. Distinct improvement in the compounding of rubber tires has made possible obtaining from 15 to 25 per cent. more mileage on one battery charge than with some of the earlier makes. An instrument for checking tire efficiency now in general use has also made practical the user knowing what he is getting in tire quality before putting tires into service, averting possibility of reduced mileage and increased current consumption from inefficient tires.

Earlier motors were patterned directly from street car motors, but, due to more exacting requirements on account of small gearing and closer limits required, considerable difficulty was experienced with motors with plain bearings lubricated with grease boxes. This trouble was experienced especially on gear driven trucks. The wear of bearings caused the gears to separate so that rapid wear and frequent breakage of the teeth resulted, causing bent shafts and other damage. The adoption of ball bearings eliminated these troubles. Undercutting the mica of the commutators greatly reduced motor trouble. Sand papering the commutators daily was necessary with some of the early motors, the result being short life of the commutators and brushes, and causing low efficiency and high upkeep. The commutators of today will probably outlast the truck and the brushes give from two to three years' service. The use of the continuous torque type controller, affording smooth acceleration, and easily renewable parts, so that controller repairs are simple jobs that can be done by drivers, obviating delays and loss of service, is another decided advance. The old step by step controllers required as constant attention as the commutators, due to arcing and burning at practically every point. Controllers are now built to run the batteries in series permanently instead of making series-parallel combinations.

The improvement of wiring installations, the use of conduits to protect the cables and greater permanency of these systems, artillery type wheels, the use of ball and roller wheel bearings, alloy steel springs, heat treated and better designed and installed, means for preventing spring plate shifting, rebound clips, hardened spring bolts and spring eye bushings and similar advances have all contributed toward making the electric vehicle more dependable and economical in service. He believed that there could be some improvement in lamp sockets, which would materially reduce trouble experienced with lamps. There is a tendency to turn from bell warning signals to mechanical devices that are lower in first cost and more dependable, though this has not met with general favor. Practically all parts that are subject to wear are now made renewable, which facilitates repairs, and the use of hardened and ground pins, bolts, screws and alloy steel gearing, as well as the better protection of parts exposed to dust and dirt, means greater economy.

Mr. Whitney stated that if the battery service system is confined to the battery alone the work is but partly done. The user of one or two trucks seldom has a competent mechanic, and trucks are often driven by those who have no mechanical training. Some companies are experimenting with forms of service systems, some confining themselves to battery maintenance or rental and others endeavoring to cover maintenance of the battery, chassis, body, tires, as well as painting, current and storage and washing. He believed that the adoption of the electric truck for general use would be through the development of service that would be as complete as possible. His own company had experimented to some extent in its maintenance department in Philadelphia with various helps to insure the customer continued use of his vehicle, with results exceedingly satisfactory to the user and company.

It first furnished spare wheels and batteries on a rental basis for such times as were necessary for repairs, the charge being approximately the same as the cost to the user for operating his own vehicle. During the past year experiment has been made with contracts with users, first to overhaul trucks and then maintain them, including furnishing current and garage service for fixed monthly charges, the charge including not only current and garaging, but all work and material necessary to maintain the battery to a standard capacity; making all repairs and replacements to chassis, repairs to body, painting, renewal of tires, and, in fact, every item of expense save licenses and accident and liability insurance. In every instance, and several of the users were undecided whether or not to continue the service of the trucks, the owners have not only become satisfied, but enthusiastic, and the company is convinced that so far as the experiment has been carried it will eventually lead to some system of this kind that will be the greatest help to selling electric vehicles that has been devised.

Where the owner cannot send his trucks to the garage every night some experiments have been made with the purpose of maintaining machines while stored and the batteries charged on the owners' premises. There is probability that something along this line will be worked out to relieve the owner of any other care than washing the vehicles and having the driver or watchman instructed to insert the charging plugs after the day's work. This system will entirely eliminate all objections now existing against the operation of electric vehicles, as by this the care of the battery and the chassis will be given by experts.

That this plan may be satisfactory, the central station, the manufacturer, the battery company or a combination of the three, or better still, an entirely disinterested party, may make contract with the central station to purchase current at proper prices. He will on account of quantity of work done be able to secure his battery renewals and other parts reasonably low, and by concentrating his mechanical repairs, as well as the battery and other work at a central point where it can be handled economically, be able to furnish this service to the user at attractive prices and there will still be sufficient margin of profit. A maintenance system of this kind will be advantageous principally to the user of one or two trucks. Owners who operate fleets of trucks are usually well equipped and take advantage of numerous economies under the direction of capable men, thus avoiding troubles which at the present time stand in the way of the small users of electric trucks.

### THE THIRD SESSION.

At the opening of the closing session Chairman William P. Kennedy of the Operating Records Committee presented the joint report of that committee and the Garage and Rates Committee. This was intended to supplement previous findings with graphic illustrations to bring out in a more visual and convincing manner the facts and figures developed in previous reports. Graph No. 1 showed a curve giving the daily operating cost of each size of electric vehicle as has been proved to be normal in varying services in which these types have been employed. Graph No. 2 was a visual indication of the energy usually consumed in charging electric vehicle batteries in public garages, or wherever groups of machines are employed. Graph No. 3 was devised to determine the requirements of floor space for various sizes of electric vehicles in garages. A chart showed an analysis of the cost of garaging electric commercial vehicles, and is intended to be of use to those

concerned with the elements of cost to be considered in connection with garage charges.

### CENTRAL STATION CO-OPERATION.

Vice Chairman E. S. Mansfield presented the report of the Central Station Co-Operation Committee, which stated that as a result of the consolidation of the two associations the work of the committee would be greatly facilitated, not only in increasing the number of central stations to work with, but also in creating a more sympathetic feeling toward the electric vehicle now represented by a section, and the work of the committee can now be more easily and effectively done; that greater activities may be expected and a more satisfactory realization.

### BATTERY SERVICE.

P. D. Wagoner, president of the General Vehicle Company, then presented a paper on "Battery Service—A Unit in a Comprehensive Plan for the Successful



E. P. Chalfant, New York. Member Executive Committee for One Year.

### Exploitation of the Electric Vehicle."

The writer maintained that the best battery system, exchange battery plan, multiple method or whatever name you choose to give, is not a cure-all, may never be self-contained as regards being independent of the central station, and certainly must be secondary to the electric vehicle itself. The principle involved offers a solution for certain problems. The application of the principle will find favor first where the idea appeals to progressive men as one having merit. I repeat—battery service is not a cure-all—not a "nurse" for the electric vehicle. It is a unit in a comprehensive plan for the successful exploitation of the electric vehicle.

He pointed out that after the electric vehicle was made a good practical road vehicle, its distribution and use was still inevitably a matter of evolution as to its application. By this is meant that experience taught ideas of adaptability and scientific operation. Not only do users in various trades progress in knowledge from year to year, but in a broad sense entire cities modify their ideas of electric truck qualities, as experience has shown users therein what the electric will do when operated efficiently. While the battery service principle may be adopted and successfully applied in a city where there are a very few electric trucks, battery

service is in line with the general evolution of the electric truck idea and represents at this writing the foremost step in electric truck progress.

Battery service, rightly applied, is a success because it supplies a clearly defined and existing need. It stimulates the sale of electric trucks and simplifies matters for the electric truck user, due to the fact that it reduces his operating costs to a definite basis. Even if the battery service system did not show him any saving over charging, inspecting and maintaining the batteries himself, he would much prefer to obtain the benefits derived from the flexibility of the system. The average man is still somewhat mystified by electricity and its wondrous workings. Storage batteries, kilowatt hours, amperes and volts, to him, all move in the world of mystery. The business man often feels that he has not the technical knowledge necessary to intelligently handle electric trucks, and is likely to question the ability of his employees to solve the "mystery" of the storage battery.

Another mystery to the business man is the amount of current required to operate electric vehicles. He does not want to know the cost in terms of kilowatt hours. He wants his transportation measured in car miles. Two parties are most vitally interested in the continuously satisfactory performance of the electric vehicle—the central station man who has current for sale, and the merchant or manufacturer who has goods to move. In the past these two have misunderstood each other. The merchant or manufacturer has been trying to buy motor vehicle transportation; the central station man has been trying to sell kilowatt hours. The battery service plan brings together the central station, the merchant and the truck manufacturer or his agent, and enables all three to work out on a common and mutually satisfactory basis the problem of the individual user.

The idea of using duplicate batteries to obtain additional mileage, either for long runs or to overcome abnormal operating conditions, is not new except as to specific application. The plan has been worked out successfully for taxicabs and mail wagons abroad, and a textile mill, two coal companies, a postal transfer company, a number of central stations and several department stores, to my knowledge, developed private battery exchange methods some years ago, and I assume many other electric truck users have applied the idea.

I am indebted to Mr. E. R. Whitney, vice president of the Commercial Truck Company of America, for the following notes on a plan that they have in operation in Philadelphia.

"Of course the question always of first importance is keeping trucks continuously in service. We have a very well equipped service station where we garage from 35 to 40 trucks. This service station is equipped to do all kinds of repair work, including chassis, battery and body. We carry a complete stock of spare wheels, equipped with rubber tires, for all capacities of trucks, which are rented to the user at an amount which will net us a small nominal profit. We also carry spare batteries for all sizes of trucks for rental on the same basis, and in the same manner we are equipped for renting a complete truck if necessary to take the user's truck out of service for extensive repairs, painting, etc. In this way, while the users pay for this service, they are very glad to do so, as it makes their electric truck almost absolutely dependable for use every working day.

"We are offering guaranteed service at so much per month, which includes any one or all of the following items: Garage, washing, current, chassis maintenance, tire maintenance, battery maintenance, body maintenance, the latter including touching up and varnishing one year, the complete repainting the next year. In this way, while the cost would be slightly more than it would cost the user of a large number of electric trucks who had a well organized force, the cost is less than the amount a small, inexperienced user would spend for maintaining his trucks in the same condition himself."

Six or seven years ago the company



which I represent began to supply what we still call the "underslung" cradle, to facilitate the use of duplicate batteries. The truck is driven over a pit and the exhausted battery dropped down directly under the vehicle and the new battery placed in position hydraulically. What we call a "universal" battery cradle has now been devised, which holds the battery in trays and admits of the easy exchange of the battery and cradle as a unit, or easy access to the battery while installed in the vehicle. Naturally, it has taken several years of careful constructive work on the part of the several interests involved to develop these ideas to a point where they are suitable for general commercial use.

Having settled that the limitations of mileage, hills and bad road conditions could be overcome by the use of exchangeable batteries, the next question to be decided was the charge for the electric current, for, obviously, it would be almost impossible to continuously exchange batteries in all states of charge and discharge and keep accurate account of the kilowatt hours input or output. At this point Mr. A. C. Dunham of the Hartford Electric Light Company and his organization, with the vehicle manufacturer co-operating, came to the assistance of vehicle operators and devised a system by which the owner of an electric vehicle could be billed "by the mile" for electricity used. Exchangeable batteries and electricity by the mile were united, and building on these factors there was gradually evolved a system for the operation of electric vehicles which is now known as the Battery Service System—also called the Geveco Trucking System, "The Trouble Proof Method."

When an electric vehicle is to be operated on the Geveco Trucking System it is sold to the purchaser without a battery, the vehicle being equipped with a specially designed detachable battery cradle. It is by the use of this quickly exchangeable cradle that the company furnishing power is enabled to exchange a discharged or partly discharged battery for a fully charged one in from two to five minutes. This feature enables the user of the electric vehicle to obtain practically unlimited mileage.

The purchaser of the vehicle contracts with the central station operating the Geveco Trucking System to furnish all power for operating the vehicle, supplying charged batteries as often as may be required to keep the vehicle in operation for as many hours a day as the owner may feel desirable. In some cases where extra long mileage is desired, batteries are exchanged several times a day. The central station furnishing power makes a monthly charge for the service (i. e., having batteries on hand ready to exchange at any time) and the power used is included in a bill to the customer at definite rates a mile, according to the size of the vehicle and amount of mileage used as recorded by the odometer. The ready exchange of batteries eliminates restrictions because of grades. It also relieves the merchant of troubles which come with snow covered streets, and the extra rush trips required during the holidays. In fact, the Geveco Trucking System admits of operating the vehicle 24 hours a day should this be necessary.

The uncertainty as to the cost of operating frequently deters a merchant from purchasing a motor wagon, but under this system he can, from tables, be shown in advance the exact cost in detail for the operation of a vehicle per month and per mile with all the principal items definitely fixed. The usual schedule of charges under this system recognizes the use of vehicles for the greatest possible mileage, the cost per mile decreasing as the mileage increases. That such purchasing of electric power by the mile is flexible and attractive is shown by the fact that of the customers who have purchased vehicles under the battery exchange system in Hartford, 63 per cent. have so purchased to replace gasoline vehicles, and the purchasers have stated that they would not consider returning to the use of gasoline machines. This certainly is a practical demonstration of the fact that

electric vehicles, when operated upon a known cost per mile, are preferred by the merchant.

We have gone at this matter very conservatively. We co-operated with the Hartford Electric Light Company very closely during the first year the system was in operation there, and then we watched another year to see how the plan would work out. Then in co-operation with the Washington Water Power Company in Spokane, Wash., we developed the system at that point. We watched this tryout point carefully and compared figures on the respective systems in the two cities. A certain similarity in operating costs was shown, regardless of the fact that one city was level and the other city hilly, and we felt that the idea could be safely expanded. At the present time the battery service system of the General Vehicle Company, Inc., is effective in Hartford, Spokane, Boston, Baltimore, Harrisburg, San Francisco, Los Angeles, Worcester, Fall River and Wichita, with many other cities pending.

The Hartford Electric Light Company has sold G. V. electrics since 1910 and every truck is still in continuous active service. In the first two years that it operated the General Vehicle agency it sold 15 G. V. electrics. In June, 1912, it started with 18 trucks on the system; in June, 1913, with 32; in June, 1914, with



S. V. Norton, Manager Truck Tire Sales, B. F. Goodrich Company, Akron, O.

46; in June, 1915, with 62, and on April 1, 1916, it had a total of 77 trucks on the battery service system. This with but one manager-salesman, giving perhaps one-third of his time to actual selling.

A good battery service system insures several things, among them continuity of satisfactory operation for the electric vehicle user and continuity of off-peak current sales for the central station. A glance at the records of 12 vehicles on the system in Hartford discloses the fact that an average of from 1000 to 1100 miles per month, for two and three years, is no uncommon thing. At this point the paper showed the records covering periods of service ranging from 13 to 54 months, with total mileages from 13,663 to 47,850, and monthly mileage averages from \$38 to 1199. The records, averaged, showed for these machines a period of service of 32 1/3 months, a period mileage of 30,427 9/12, and a monthly mileage of 966 5/6.

The paper stated that the company is selling approximately 600,000 kilowatt hours of off-peak alternating primary current a year. It referred to a paper read by Willis M. Thayer at the convention in Cleveland in which the following summary of total operating expense and income was made, covering periods of 12 months beginning June 1 of 1913, 1914 and 1915:

	Total Operating Expense	Income
First year.....	\$3,847.50	\$5,543.88
Second year.....	13,505.82	18,559.07
Third year.....	14,352.38	26,559.13
Three year total.....	\$31,705.79	\$50,662.08
Nine months, fourth year.....	10,397.72	22,167.51
Total .....	\$42,103.51	\$72,829.59

Excess of income over total operating expense for 45 months, \$30,726.08.

Mr. Wagoner stated that these figures do not include depreciation on the battery equipment or interest on the money invested in the same, that they do, however, include all operating costs, power, etc., and he emphasized that perhaps the notable point in the figures is the improvement in the results attained with increasing number of vehicles. During the first three years of operation at Hartford the ratio of "operating items" to "income" was approximately 63 per cent., while during the first nine months of the fourth year the ratio was approximately 47 per cent.

In Boston the system has been in practical operation only a short time. Eliminating what might be called the converted pleasure car type of commercial vehicle, the G. V. electric is fourth on the list of all registered commercial vehicles in Massachusetts. The 27 G. V. electrics on the service in Boston have been sold largely within the last four months. Such sales gather momentum rapidly once the ice is broken in leading lines of business. A significant feature of the battery service system is that it enables the merchant, where delivery demands require but one or two light electrics, to buy them at a material saving in investment and be sure of satisfactory and economical service. Smaller firms are adopting the electric 10 times more rapidly where the system is available than where it is not. Retailers in suburban districts who go into the city for their supplies each day, buy electrics where the system is available. Merchants who deliberately buy gasoline cars at higher cost than electrics, rather than buy charging equipment and charge the electric on their own premises, waive their past objections when offered service on the per-car-mile basis.

The electrics on the system in Boston represent varied lines of business. There are five mail wagons on the system. A great pickle concern that is fast approaching 57 in electric truck usage throughout the United States, has two trucks on the system. A great tea house, a tin can manufacturer, a wholesale plumbing supply house, a sawdust dealer, and a wholesale wine house have all ordered vehicles to go on the system. Besides this a spring water company has ordered a two-ton machine and the city of Boston has contracted for watering its streets with a fleet of 3 1/2-ton G. V. watering carts which will be supplied by the battery system. The city has several electric patrol wagons in service.

The paper then contained a summary of the work of three five-ton electric trucks operated with battery exchange service which had been operated 152, 23 and 16 days, the figures being up to March 1. These machines average 31.8 miles a day, working an average of 13.6 hours a day, making 1036 trips and carrying 6138.7 tons, with average of 5.7 miles to the trip, and average loads of 11,850.8 pounds. The total cost a truck a month was \$36 for battery service, the mileage charge of \$56.10, and \$26 for garaging, a total of \$118.10. The standard costs for operating 31.8 miles a day was \$5.93, this being a saving to the customer of \$1.39 daily. During March, with exceptionally severe weather, 31 inches of snow falling in 15 days, the trucks averaged 763 miles in 27 working days, and 21 miles was obtained from fully charged batteries.

Though the progress of the system in the Far West is somewhat retarded by business conditions, in Spokane 12 vehicles are operated by it. One one-ton wagon is being driven 20,000 miles a year,



having two drivers, each working nine hours, and using two batteries. This means an average of 66 miles a day with the system for more than two years.

Our experience has taught us that we are on the right track. We have reached certain definite conclusions and some of these I would like to leave with you for thoughtful consideration: The idea behind the battery service system is commercially sound. It makes possible, through co-operation, the distribution of what might be called the development difficulties of all three parties interested—the electric vehicle manufacturer, the central station and the electric vehicle user. It makes possible the manufacturer giving more adequate service to the industry; it insures greater electric truck load for the central station, and it does away with the stumbling blocks which have heretofore confused and discouraged the electric truck user.

There is a difference, however, between battery exchange and battery service. Duplicate battery plans as developed by large firms or others independent of the fundamental idea of service as developed in the above plan, fall short of the ideas which I have tried to present. Under the battery service system the operation of electric vehicles is reduced to the simplest possible form, and means to truck users: A substantial reduction in truck investment; no charging apparatus or garage investment; unlimited mileage and continuous service from trucks; busy season difficulties and bad roads overcome; relief from care of batteries and a reduction of all items of battery cost, including current, to a definite monthly basis of miles travelled.

The central station's business is to deliver current to its customers. Ordinarily, at considerable expense, it delivers its currents through a sub-station, over a distributing system to transformers, house connections, meters, etc. Under the battery service system the central station delivers its current to its customers in a container, namely, the battery, and thus saves the distribution system expense. This is a relatively new method of delivering current to a customer, but is just as much a part of the regular business of the central station as the old method, with the advantage, however, that under the new method the investment in batteries becomes productive as soon as made, and this investment is paid back to the central station on the installment plan by the readiness to serve charge made to the purchaser of current. The battery service system places the electric truck in a different class from the electrical truck as formerly considered.

At the conclusion of the paper Mr. Wagoner read a series of letters from users of the system in Spokane and other cities in which entire satisfaction with the service was expressed.

President E. W. Lloyd addressed the session, stating the value that would obtain from the centralization of promotive endeavor, that the affiliation would be beneficial and that there would be very general recognition of the utility of electric vehicles from the central stations.

The nominating committee then reported the following officers as its choice for the coming year, which report was unanimously adopted:

Chairman, E. S. Mansfield, Edison Electric Illuminating Company of Boston, Boston, Mass.; vice chairman, George B. Foster, Commonwealth Edison Company, Chicago, Ill.; treasurer, H. M. Edwards, New York Edison Company, New York, N. Y.; secretary, A. Jackson Marshall, New York, N. Y. Executive committee, for three years, Walter H. Johnson, Philadelphia Electric Company, Philadelphia, Penn.; Arthur Williams, New York Edison Company, New York,

N. Y.; Frank W. Smith, United Electric Light and Power Company, New York, N. Y.; P. D. Wagoner, General Vehicle Company, Long Island City, N. Y.; for two years, Charles Blizard, Electric Storage Battery Company, Philadelphia, Penn.; Frank W. Frueauff, New York, N. Y.; G. A. Freeman, Walker Vehicle Company, Chicago, Ill.; Charles A. Ward, Ward Motor Vehicle Company, Mt. Vernon, N. Y.; for one year, H. G. Thompson, Edison Storage Battery Company, Orange, N. J.; E. P. Chalfant, Anderson Electric Car Company, New York, N. Y.; James H. McGraw, New York, N. Y., and H. W. Suydam, Toledo, O.

Chairman E. S. Mansfield addressed the members, urging the possibilities of co-operation. He was followed by E. P. Chalfant, who read a very instructive paper on "Passenger Vehicle Problems and Activities." In discussing this paper Frank W. Smith, a former president of the Electric Vehicle Association, stated that the central stations have contributed most of the money for two extensive advertising campaigns directed



W. P. Kennedy, New York, Transportation Engineer, Speaker on "Central Station Promotion."

by the Electric Vehicle Association, and that the central stations were willing several months ago to contribute \$35,000 to \$40,000 for a third campaign provided that a similar amount was contributed by the electric vehicle manufacturers, but the manufacturers had taken no action toward raising the amount of money required from them.

#### Central Station Promotion.

The closing paper of the session was read by William P. Kennedy, and was on "Central Station Promotion of Electric Vehicle Use." His paper in part was:

To judiciously recommend to the central stations what they should do, the whole problem must be viewed from their standpoint rather than that of the manufacturers of vehicles or their equipment constituents. He summarized a series of pertinent inquiries as follows: Shall the vehicle business development be classified by the central station with its present activities for the promotion of sundry lighting and domestic utilities, or shall the project be regarded on a par with new business of great magnitude

such as many central stations are seeking in the direction of street railway load and steam railway terminal electrification? If the central station decided to keep the vehicle in the same class with its minor domestic apparatus load development, there is not much more to be done than to continue the limited efforts which are being given to it at present in the general conduct of the central station business. If the proposition is to be classified with the major new load development, then serious attention must be promptly given to the matter by the leaders in the administration of central station properties. Immediate attention is necessary, even if a decision should be reached adverse to the development under consideration.

Urgency is essential because a crisis exists at the moment which will determine whether the electric vehicle business will simply float along in a passive state of existence, with regard to other motor vehicle development; or whether it can be invigorated to such an extent that it will maintain its place, in cities, on a par with other vehicle development; with consequent superior revenue to the interested central stations. This crisis has arisen from two causes, one relating to the passenger car and the other relating to the motor truck.

In the passenger car field, it is quite evident, even to the most casual observer, that the gasoline passenger car business has progressed in each of the past few years in a phenomenal manner, with quantity production from most of the factories which was previously undreamt of and with a consequent fall in market or selling price; which, if it continues, will simply stultify the electric passenger car business to that very limited field where it will be selected by the wealthier class of purchasers on the sole basis of comfort and luxury.

With regard to the motor truck field, there has been an extraordinary and abnormal development in the demand for gasoline motor trucks for military purposes in Europe. Previous to this demand few of the manufacturers of this type of machine had produced or sold trucks in quantity as the electric vehicle manufacturers had. Consequently, they knew little of the economic possibilities within their factories or sales departments which are attendant upon quantity production of this type of vehicle. These export orders have enabled them to clear out their old or obsolete materials; to organize their equipments for quantity production; to learn what could be done in reducing prices based upon quantity orders; and have created a pressing desire, on their part, for the continuance of such quantity business. Therefore, just as soon as the present export business ceases or declines, these gasoline motor truck producing organizations will proceed to develop the domestic business in competition with one another, and with such zest and vigor in effort, and the spending of such quantities of money for exploitation, that the already enfeebled electric vehicle manufacturers will be unable to make any progress against them. Under such circumstances the electric vehicle load opportunities for the central stations will disappear.

With this view of the situation immediately ahead, and assuming that it may be regarded advisable to develop this type of load, he believed that any limited expenditure for co-operative advertising could only be regarded as having very transitory value. It would probably keep the electric vehicle business alive for the time being, but it would not have definite development influence. To build up a permanently increasing load he believed something more radical than anything that has as yet been done by central stations for the promotion of electric vehicle use would be necessary.

The line of competitive attack upon other types of transportation apparatus employed, or to be employed, in cities, can only be successfully made upon the basis of guaranteeing the superior economy of the electric vehicle. If users of vehicles, passenger or commercial, could be assured of what we know to be the low cost of operation, by means of a ga-

rage service covering the upkeep and maintenance of the complete vehicle in working condition for a flat price per annum, these users would undoubtedly adopt the electric vehicle in preference to any other type of machine. No competition on the part of gasoline trucks could withstand such guaranteed service cost. They could have no such organized effort in their behalf as the central station can exert or promote in this direction.

Service and the cost of it are what every user is primarily interested in. The central station can render such service, but it would probably be more practicable to provide for it through collateral organization. A surprising profit can be made by such operations, aside from the advantage of permanent increased load of such size as to rival the existing load of any central station organization, depending upon the degree to which such exploitation is carried. No permanent investment more than three per cent. of the amount which the owners put into their vehicles would be required for the equipment with which to conduct such an enterprise; and 30 to 40 per cent. of what the user would pay for such service would be net revenue, the cost of operation being not more to the user than if he furnished the service himself. In addition to this general maintenance plan, other special types of service, such as the battery service system, can be added wherever they can be used to extend the scope of the business.

Such an undertaking would be well within the range of the legitimate activities of central station organizations. It would be nothing more than adding to the present lighting service and power service a vehicle service, the principal function of which would be to supply energy and maintain this type of energy-consuming apparatus in working condition; in a somewhat similar but larger way than methods now employed to maintain lamp equipment, or the several other types of devices which are supervised in such a way as to insure to the central station that they continually remain in condition to consume its energy supply.

In further considering the proposition, Mr. Kennedy maintained that it had features that are far superior to any of the lines of development in which the central station is now engaged; that larger sums of money are spent to develop demand for the utilities which the central station fosters; that missionary work of the most laborious and expensive character must be conducted to break the public away from its traditional inclination to use other forms of motive power; that in the field of heating and other domestic conveniences the limited progress made seems out of all proportion to the cost of securing the business.

With reference to the motor truck the demand already exists, and is being stimulated by the expenditure of vast sums of money such as was never previously expended in the history of any other commercial development. The change from the older forms of transportation is already under way, and is already accomplished in most of the larger cities in the passenger vehicle field. A few short years will see the impending change in the commercial field complete. Nothing can resist this change, as the fundamental law of necessity is forcing the issue. He pointed out that this field was open for central station activity. In this instance it can capitalize upon the collaboration and expenditures of hundreds of other organizations in the automobile field which is promoting a similar demand upon the public, and it simply remained a question whether in the present period of transition from the use of animal power to motor power in cities, the change would be almost completely affected by the use of internal combustion machines, or whether the central stations could be aroused to a state of interest and energy where they will demand and secure a large proportion of the conversion by means of electrical energy consuming apparatus.

He emphasized that the central stations have every possible advantage, having their own organizations well nigh perfect, that they were long and well estab-

lished, possess public confidence, and that they have really no serious competition. They are already doing business with nearly all users of transportation equipment in their respective cities, have at their command vast sources of energy supply that are inactive a considerable part of every day of the year, many have existing departments using or caring for this type of vehicle which has already educated them to the value and economy of electric vehicles, and there is already available abundant testimony from all parts of the country that electric vehicles can and do perform city transportation at a cost substantially below any other apparatus used. There was nothing experimental in the establishing of such new branches and they would not have to depart in policy from principles which they have laid down as fundamentals for the conduct of their business.

He maintained that the existing volume of business could be doubled by securing to it the total electric vehicle service load available in central station districts. Further, that no other investment would be necessary for power plant equipment, and once the load is secured upon a station's lines it would permanently remain there, yielding revenue from year to year, and likely to increase rather than decrease with the development and progress of each respective community. In considering possibilities he maintained that the total load that could be obtained was enormous. In several of the larger cities it would range from 50,000,000 to 100,000,000 kilowatt hours a year, and in many of the cities of secondary size it would reach from 30,000,000 to 50,000,000 kilowatt hours yearly. Coupled with an attendant service the sale of this energy, the rate for combined service could include a rate of four cents a kilowatt hour for energy, which is seemingly a fair figure, considering present cost.

Mr. Kennedy maintained that the prospect for electric vehicle business was immediate, as the change in transportation equipment was actually under way, independent of any effort whatever on the part of the central stations, and they could go out and obtain a share of it, while any other business could be at best a gradual accumulation extended over a long period, with the entire price of obtaining it paid for by the central station.

#### BIG DAYTON TIRE CONTRACTS.

The Dayton Tire Company, Dayton, O., has made exclusive contracts with the Dayton Engineering Laboratories and National Cash Register companies of that city to use Dayton tires. There are two kinds of Dayton tires, the pneumatic and airless. The Dayton airless are not only standard equipment on a majority of the fire fighting apparatus, but are also in use on many pleasure cars. They are puncture proof, easy riding and economical. The Dayton pneumatic is a hand-made product and is guaranteed for 6000 miles.

#### TRUCKS SAVE FARM LABOR.

T. J. Hudson, manager of the motor truck department of the Chicago Pneumatic Tool Company, sees in the motor truck a solution of the farmer's labor problem. Discussing the subject, he says:

"From now until the end of the harvesting season the question of farm help is going to be very acute. Our great industrial prosperity is providing plenty of work in the cities at good wages and very few city laborers will emigrate to the country this season. According to government statistics the time consumed

by the farmers in hauling goods from the farms to shipping points with horses and wagons is equal to the time of 60,000 men a year. If all farmers used motor trucks the time of 40,000 men would be released for farm work. This additional help would be a big boon for farmers. Farmers are rapidly becoming acquainted with the time saving possibilities of the motor truck, and as they foresee the probable scarcity of farm help during the coming season, our rural agents are finding it an easy matter to interest them in Little Giant trucks."

#### HILTS GOES TO PURITAN COMPANY.

M. R. Hilts, formerly connected with the advertising department of the Oakland Motor Car Company, and with the Paige-Detroit Motor Company, Detroit, has been appointed assistant to Frank M. Eldridge, advertising manager of the Puritan Machine Company of Detroit, Mich. An increase in the advertising staff of the Puritan Machine Company has been made imperative by the enormous increase in the company's business during the past year.

#### AUTO PARTS MAKERS MERGE.

The Motor Products Corporation, with \$10,000,000, has been formed by the merging of the Rands Manufacturing Company, Detroit, Mich., makers of steering wheels, windshields and tops; the Vanguard Manufacturing Company, Indianapolis, Ind., maker of windshields and specialties; the Diamond Manufacturing Company, Detroit, Mich., maker of stampings for radiators, radiator shells, hubs, hub caps, engine manifolds, radiator tubing, etc.; Superior Manufacturing Company, Ann Arbor, Mich., maker of lighting systems and windshields; Universal Metal Company, Detroit, Mich., maker of metal tube and specialties, and the Diamond Manufacturing Company of Walkerville, Ont., a subsidiary company of the concern having the same name at Detroit. The combination is made under the laws of New York. The officers of the corporation are W. C. Rands, president; D. H. Lee, vice president of the Diamond Manufacturing Company, treasurer and general manager; C. F. Jensen, president of the Vanguard Manufacturing Company, vice president and overseer of purchasing; H. H. Seeley, president of the Superior Manufacturing Company, vice president and sales manager; M. Louis Brown, treasurer of the Universal Metal Company, secretary and manager of the tube production. The board of directors includes the officers and R. R. Seeley, who is production manager.

The June number of "Chase-em," the monthly publication of the Chase Motor Truck Company, Syracuse, N. Y., contains, in addition to its usual features, a very interesting article by William H. Himmelsbach of the company's engineering department on "An Exclusive Chase Feature," which deals with the use of the "strut rod" and springs in the construction of Chase trucks.

## NEED OF TRUCKS FOR SERVICE IN MEXICO.

**Thousands of Machines, Both Standard and Special Types Equipped for War Purposes, Must Be Had In the Operations of the Armies of the United States.**

**P**REPAREDNESS has been talked by prudent men since the beginning of the European conflict, and, with all the discussion and consideration of the subject, in nearly two years the impending war with Mexico, and this is not an unfounded statement, has found the United States in a state of unpreparedness little short of pitiful, so far as the need of army transport is concerned. There is, of course, reason for confidence that the motor vehicle industry will be able to produce a sufficient number of machines to meet the requirements, provided that time is taken, but there is by no means anything like the vehicular equipment in readiness, nor even obtainable, unless the United States resorts to what would be the most practical solution of the situation and commandeer all the trucks required and wherever they may be found.

### 125,000 Trucks in United States.

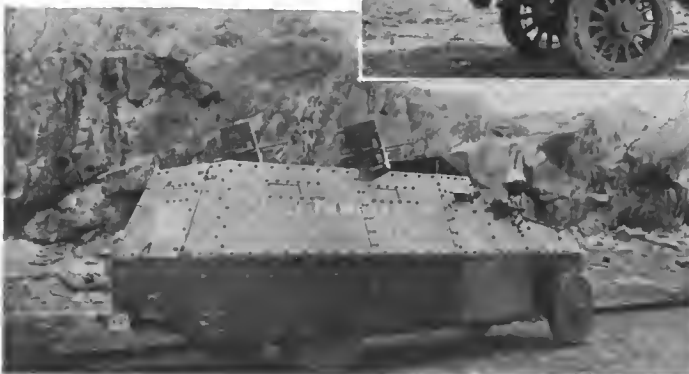
There are in the United States today probably 125,000 gasoline vehicles used for industrial and commercial purposes, and one might say that a half of these are serviceable so far as haulage of some kind is concerned—the other half is machines that are converted from pleasure chassis and those types that are too small to be of material value. Undoubtedly from this large number—let us say that there are more than 60,000 privately owned trucks that may be regarded as practically serviceable—sufficient equipment may be obtained, but this would place in the service so many different machines that maintenance would be a much more difficult and complicated problem than were these of comparatively few makes.

The conditions to be met with in Mexico are entirely different than has

been dealt with by any of the warring nations abroad. Between the greater part of Texas and Mexico is the Rio Grande river, but west of this, nearly to the Pacific Coast, the boundary is through country that has but few settlers and the towns are comparatively long distances apart. Several railroads enter Mexico, but while these might be utilized if controlled by the United States, transportation from them, and from all points along the border into Mexico, must be over what are in most instances horse trails. There are some rough wagon roads, and these might be utilized to some extent, but the greater part of the country is either desert or mountains, where vehicles can progress but slowly, and machines that would be of extreme value where highways are such as may be found in the United States, cannot be used to anything like the same advantage that they are now used in Europe.

### Troops Will Enter Mexico.

Just what form the warfare will take is uncertain, but there is little doubt that eventually the United States troops will cross the border into Mexico and will move southward, because there is no material reason to expect that there will be invasion of the United States, unless by bands of unorganized men, who will be more bandits than soldiery, and who will not make systematic campaigning so far from their own individual territories. But in any event the warfare will be largely in Mexico, and troops can be sent across the line from different points and southward. While there are railroads, these are not so located that they can be depended upon wholly. The actual transport of supplies and men must of necessity be



Upper Centre, Four Wheel Drive Truck, Equipped with Machine Tools and Supply of Parts for the United States Service in Mexico; Lower Left, Mack Armored Truck Owned by New York National Guard Battery; Lower Right, Sanrer Truck Carrying Field Gun for California Militia.

by roads or trails, and conveying these over what is largely unbroken country will require a great many more vehicles than would ordinarily be used for the same volume of freightage.

#### **Urgent Need of Armored Vehicles.**

But aside from this, there will be need of armored cars and trucks, and a very large number of these machines must be provided. One should understand that the Mexican troops are mounted to a greater proportion than are the soldiers of other nations. This gives the different effective units the highest degree of mobility. Those who are familiar with the conditions met with by the English during the Boer war and in the African campaigns, will realize that these will be somewhat paralleled in Mexico, but the country is very rough and mountainous, the deserts are numerous, water is not frequent, and the armies will find that there will be little, if anything, obtainable from the country. Instead of cattle and crops that might be expected in other countries, in Mexico the land has been practically stripped of everything, and for this reason every form of supply will have to be carried into it from the United States.

This means that the supply

greater or less extent, or until the requirements are better known. Statement is made that a very large number, something like 6000 automobiles owned in the southwestern part of Texas, have been listed and will be commandeered by the army to carry troops, but this resource is but a small part of what will be actually needed once the campaign is begun.

There are in the United States today several armored trucks, which are owned by an armored battery of the New York national guard, which equipment has been given by a number of public spirited citizens. The intention was to have a number of experimental machines built, and four of these were designed and, at this writing, are probably available. The largest of these is a two-ton Mack truck chassis, which was equipped by the International Motor Company, while a 1½-ton White chassis, a two-ton Jeffery chassis and a six-cylinder Locomobile touring car chassis were also to be armed and protected so far as possible. Aside from these no other armored machines are available, so far as is known. However, as a large number of armored trucks were built in this country for the use of some of the European armies, there



Upper Centre, Four Wheel Drive Tank Wagons in Service at Columbus, N. M.; Lower Left, New Type of Christie Front Wheel Drive Tractor Designed for Army Service; Lower Right, Armored Mack Truck of New York Militia in Mobilization Trials at Sheephead Bay.

trains that will at first be used, and which can later be operated from the different railroads to the army bases, must necessarily be larger and heavier so far as the volume of freight is concerned. There must be well established lines of communication and these must be effectually protected, and time will be required to organize these lines and systematically forward the supplies.

Within a comparatively short time a seemingly large number of trucks has been sent to different points of mobilization along the border, and many are used in the transportation of supplies to General Pershing's army, but these are only a drop in the bucket as compared with what will be necessary when the campaign is fully developed and the United States armies are in the field. For one to predict what equipment will be best adapted for the needs of the armies is folly, but one can state with assurance that vehicles such as were used in Europe will be utilized to a

is reason to believe that similar types could be produced in a comparatively short time.

Just what provision has been made by the government for procuring and equipping trucks is not known. Practically all of the machines that have been used for supply transportation were sent from the factories with standard type bodies, and in several instances machine guns were mounted on these. But no attempt was made to armor them. In contrast with what the European armies now have there is seemingly an endless need to be met before the United States army can be considered as even reasonably well equipped.

#### **Operations of Motor Transports.**

According to an officer of the commissary department of the quartermaster general's department of the United States army the general operation of transport in the field is as follows:

"The tactical unit of the modern army is a division of 22,000 men, which requires 170,000 pounds of food



per day. There are two methods of securing these supplies, one by foraging and relying on the country and the other by bringing up supplies from the rear. Both methods have been used to supply ancient and modern



Crew of Volunteers for Truck Company for Mexican Border Duty Recruited at Shops of Four Wheel Drive Auto Company, Clintonville, Wis.

the weak spots in the truck design. The steel plate wheel is satisfactory. All electric headlights should be mounted on universal joints.

The United States army favors the 1½-ton truck because of its weight, as it can cross ordin-

ary road bridges without breaking them down. This refers to the division trains only, as heavier trucks can be used on the main roads. To attempt to use trucks of two tons or over on poor roads means disaster. On stone highways, however, the larger trucks are better.

#### Importance of Supply Trains.

The supply train is the most active, as it must carry provisions for both animals and men. The distance from the firing line to the advance depots determine the number of refilling points, but the distance between the firing line and the last refilling point must not be more than one day's march. Each wagon carries two days' food per load.

With wagons the average day's march is 18 miles, and with a total distance of 75 miles from the base, 780 wagons would be required. With motor trucks of about two tons capacity the work would be done by 120 vehicles. With 240 trucks a division could operate 150 miles from its base. A division operating 40 miles from its base would require 30 trucks.

Lessons from the present war show that ordinary commercial trucks are best and that special bodies are not required. The best all-around car is the 1½-ton size. Heavy armored cars have proven satisfactory. Motorcycles on a grand scale have proven unsatisfactory. Radiators are proving to be one of

A force of 500,000 men requires more than 8000 light trucks. The problem is where to get these trucks so that they can be organized into trains of the same make. Truck preparation requires properly organized truck units, correct truck specifications, lists showing where these trucks and suitable chauffeurs can be found and determination of the best body for use, as well as a list of necessary repair parts for each truck and the equipment of repair trucks.

#### Details of Organization.

A recommended organization of the trucks is in groups of 60, divided into three squads. For each squad there should be one repair truck, three fuel trucks, one company headquarters truck, four officers' touring cars and eight motorcycles. In charge of each squad is one captain, and under him three lieutenants, one first sergeant, nine first sergeant repairmen, 58 sergeant drivers, eight corporal drivers, three corporal repair men, three corporals and 78 privates. The regulations adopted by the war department have 27 cargo trucks and one repair truck, manned by one truck master, three assistants, two machinists and 35 enlisted men.



Centre, Riker Truck, Equipped with Flanged Wheels for Operating on Railroad, Designed by A. L. Riker of the Locomobile Company of America, and in Use in Texas; Lower Left, Trucks in Actual Service at the Camp of the Army at Columbus, N. M.; White Trucks Equipped with Tank Bodies for Carrying Supplies from the Base at Columbus, N. M., to Gen. Pershing's Troops.



## S. A. E. TO BE ENLARGED AND NAME CHANGED.

**A** PLAN whereby the Society of Automobile Engineers can extend its field of activities tremendously and enlarge its membership to at least 5000 was the most important business discussed during the second annual mid-summer cruise of the society. The scope of the proposal embraces the opening of the membership lists to members of tractor, aeronautical, marine and stationary gas engine organizations, and changing the word "Automobile" in the title of the society to read "Automotive."

The plan, which was announced by President Russell Huff and urged by Henry Southler and Howard E. Coffin, is consequent to the wish of the United States government to obtain help from the engineering societies of the country, particularly for army and navy purposes. If the members of the society agree to the proposal, and it will not be decided before next January, it will mean that the S. A. E. will become one of the most influential scientific bodies in the United States.

Another suggestion made at the same session was that the board of directors be made up of 15 members, there being one president, one vice president and five second vice presidents. The proposal to adopt a new method of choosing the nominating committee and to create a new class of membership was accepted without much opposition.

The new grade of membership would be known as the United Service En-

gineer, the qualifications being the same as those for full membership to the society, and entailing an initiation fee of \$10 and annual dues of \$5. The privilege of voting is withheld from this class of members. The purpose is to make it possible for engineers in the United States army, navy and other departments to have the benefits of belonging to the S. A. E. and at a membership rate that is more nearly equitable with their relatively low incomes.

It is possible that the duration of the cruise next year will be five days, instead of four as formerly, which is due to the fact that the full programme of papers could not be covered as fully as the members desired on this year's voyage. The discussions scheduled were unusually interesting and comprehensive, though it was felt that there were few if any special topics that were as vitally interesting as was the case during last year's cruise, when eight and 12-cylinder engines occupied the attention of the engineers.

### Important Standards Work.

There were more than 540 members of the S. A. E., together with their friends and families, on the steamer Noronic when she left Detroit, June 12, and while pleasure is supposed to be one of the prime motives of the voyage, no time was lost in convening the business meetings. The reports of the standards commit-

tee were interesting and were accepted for submission to the members of the society after



Some of the Leading Figures of the S. A. E. Mid-Summer Meeting: Upper Left, Arthur J. Slade, New York City, Consulting Engineer; Upper Centre, George W. Dunham, Consulting Engineer, Probable Nominee for Next President of the Association; Upper Right, Russell Huff, President of the Association; Lower Left, H. E. Coffin; Lower Centre, Left to Right, Lieut. R. T. Yong, Henry Southler and Dr. H. C. Dickinson; Lower Right, R. M. Owens and R. R. Owens of the R. M. Owens & Co.

the various points mentioned were debated.

One of the most important reports was that made by the nomenclature division, it containing a glossary of names for every principle part of a motor vehicle. It has required more than a year of hard work on the part of the chairman of the division, K. W. Zimmerschied, the recorder, A. C. Woodbury, and their helpers to make the compilation, and it is felt that their list will be the means of overcoming much of the confusion that has been noticeable in the industry in the past.

A complete list of sizes and dimensions for flexible steel conduit for incasing electric wires was included in the report of the electrical equipment division. Another recommendation, which was accepted, was the adoption of a standard headlight bracket in three sizes. The same division gave the opinion that devices for focusing lamp bulbs should not rotate the bulbs, because it would move the filament out of focus line; that lamps should be mounted not less than three feet from the ground, and that recommendation should not be extended to included dimming devices which operate by reducing the current.

The report of the miscellaneous division disclosed that it had proved impossible to standardize speedometer drive at this time. The recommendations accepted embraced standards for fender iron taper sockets, formula and dimensions for piston ring grooves, and an increase in the length of the thread of the S. A. E. bolt by  $\frac{1}{4}$  inch.

#### **A New Steel Introduced.**

A new steel was added by the iron and steel division, while the other divisions of the committee had little but general progress to report. In all reports it was evident that the members had been and expected to be exceedingly industrious in devising standards for the motor vehicle industry.

At the meeting of the council K. W. Zimmerschied was elected a life member, without the payment of further dues, as a tribute to his valuable work as chairman of the standards committee.

President Huff opened the business meeting with a brief address, the theme of which related to the expansion of the society by admitting members of engineering bodies in allied lines of industry. Following Mr. Huff's talk, Herbert Chase delivered the treasurer's report for the eight months of the present fiscal year, by which was shown that receipts amounted to \$75,441.65, and expenditures \$36,072.96, leaving a balance, including the amount carried over from last year of \$47,901.96. A membership of 1910 was reported, with 66 applications to be acted upon. During the eight months 113 members and 25 students were admitted.

G. W. Dunham, consulting engineer, was nominated for president of the society for the next year, with J. G. Vincent of the Packard company as vice president and B. B. Bachman of the Autocar company and F. E. Moskovics of the Nordyke & Marmon Company as councilors. Herbert Chase remains as treasurer.

The nominating committee consisted of K. W. Zimmerschied, Detroit section; F. E. Place, Mid-West section; G. P. Dorris, Indiana section; E. S. Foljambe, Pennsylvania section, and David Fergusson, member at large.

At the professional sessions C. F. Kettering's lecture, entitled, "Future Scientific Development of the Automobile," proved to be very interesting and instructive. He demonstrated with liquid air, high frequency currents, radium and other unusual agents to illustrate his talk and performed feats that were likened to wizardry. He brought out forcibly how the discovery of one new product would create an entirely new industry and would effect existing industries.

#### **Papers Read and Discussed.**

Among the other papers presented were "Car Performance," by D. L. Gallup, professor of gas engineering, Worcester Polytechnic Institute; "Differential Substitutes," by D. D. Ormsby, Brown-Lipe-Chapin Company; "Recent Aeroplane Developments," by Neil MacCoull, Westinghouse Machine Company; "Mechanical Transport Mobilization," by Arthur J. Slade, consulting engineer; "Dynamics of Vehicle Suspensions," by Dr. Benjamin Liebowitz, research engineer; "Kerosene Versus Gasoline in Standard Automobile Engines," by Charles E. Lucke, professor of mechanical engineering, Columbia university.

Among the other members who prepared important papers were: Henry Farrington of the Thomas B. Jeffery Company, "Problems Involved in the Choice of a Motor Truck;" A. P. Brush, consulting engineer, "High Speed Engines;" Russell Huff, president of the society and chief engineer of Dodge Brothers, "Factors of Safety;" C. M. Eason, Hyatt Roller Bearing Company, "The Farm Tractor;" J. E. Hale, Goodyear Tire and Rubber Company, "Pneumatic Tire and Rim Situation;" W. H. Allen, B. F. Goodrich Company, "Solid Tires for Rear Truck Wheels, Large Single Versus Dual;" H. D. Church, Packard Motor Car Company, "Refinements and Generalities in Truck Design."

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#### **PACKARD TRUCK BOOK.**

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The Packard Motor Car Company, Detroit, Mich., has issued a 70-page book of "Information" on the Packard worm drive trucks, giving detailed instruction for their operation and care and describing the various operations of all the working parts.

The book is profusely illustrated with half tones and line diagrams, and contains a three-page insert, giving a birdseye view of the chassis with the various parts indicated in diagram form. It also sets forth the Packard dealer's service policy, which covers the relations between the users and the dealers and the Packard Motor Car Company's "warranty."

The Warren Motor Car Company is the name chosen by the L. L. Crosby Company, Bangor, Me., which will build a light power delivery wagon.

## PUBLIC UTILITY COMPANIES BUY MANY TRUCKS.

**P**UBLIC service corporations, which are extremely well organized and systematized, and are directed by men who realize the possibilities of economies, are giving very careful attention to transportation efficiency, which statement is emphasized by the large purchases of vehicles made by concerns of this character within a comparatively short time. This does not mean that the use of motorized equipment is new, but this extensive buying is the result of experience that has demonstrated that the people can be better served and at less cost than with any other facilities obtainable. During a period of about six weeks 39 different companies ordered more than 100 machines from the White company, Cleveland, O., which is maintained to be due to the extreme satisfaction obtained with White vehicles and to the high degree of specialization by the company in co-operation with some of the foremost public service engineers of the country.

The statement relative to public service may be applied to companies supplying light, power and heat, telephone service, urban and interurban railroad service and distributing water. This does not include all that may be regarded as coming within the classification. There are with all concerns supplying public utilities three aspects of economy, these being the actual saving of time and labor as represented by ex-

pense cost, the increase of territory served so as to obtain all the patronage possible with available facilities, and the maintenance of the service with the least number of failures.

### Continuous Maintenance Imperative.

The last of these is the most important. Practically every company endeavors to have its service as constantly continuous as is possible and is willing to pay for and maintain the facilities that will expedite restoration in the event of accident or destruction to the lowest practical time. No matter what the eventuality, the resources (funds, material, equipment and expert workers) must be adequate to meet it, because interrupted service means annoyance, inconvenience, discomfort and frequently hardship and loss of confidence so far as the customers are concerned, while it means financial loss and paving the way to competition from the aspect of the companies.

Aside from these considerations construction and reconstruction are important, although these need not be regarded as urgent as restoration. These factors are all weighed carefully and provided for so far as experience can determine policy and justify expense. One will understand that vehicles that can transport material, men and tools in whatever volume or numbers that may be necessary and in the least time that



Examples of Public Utility Company Special Equipments: Upper Left, Truck with Extra Long Body to Haul Water and Gas Pipes; Upper Right, Truck and Trailer Used for Hauling Water Pipe at Lynn, Mass.; Lower Left, Truck with Crane and Winch for Tearing Up Unused Railroad Track; Four of 16 White Trucks Operated by the Cleveland, O., Electric Illuminating Company.

is consistent with conditions are those regarded as most practical, and with knowledge from experience as basis for judgment, motorized equipment has been established as meeting the requirements far more adequately than any other type.

#### Superiority of Vehicles Proven.

The reliability and superiority of motor vehicles having been so fully proven, one of the objects of the engineers having charge of the operations of these concerns has been to obtain the makes of machines that have been found most economical and efficient, and another is to equip them so that there will be further saving of time and labor. In considering the possibilities of motor trucks for public service corporation uses there are seemingly no limitations, for the engineers build special devices by which certain work can be done quickly and better than with facilities formerly the vogue, and maintain that practical economies impel the use of specialized apparatus because of the large savings that are certain in probable operating conditions. To enumerate the purposes for

An example of the increase can be given in the following list of orders placed with the White company for machines, there being about 100 in all, to be delivered to 39 different companies:

People's Gas Light and Coke Company, Chicago, 1½-ton chassis; Bell Telephone Company of Pennsylvania, Williamsport, Penn., single drum power winch truck; Cleveland Telephone Company, Cleveland, O., two trucks with single drum power winches, five-ton truck with double drum power winch, five-ton power dumping truck; American Telephone and Telegraph Company, truck with single drum power winch for Chicago, 1½-ton chassis for Jacksonville, Fla., and a three-ton chassis with single drum power winch for New York; Chesapeake and Potomac Telephone Company, Baltimore, Md., two two-ton trucks for Washington, D. C., two 1½-ton and two 1500-pound trucks for Baltimore; Bronx Gas and Electric Company, New York, N. Y., two-ton truck; New York State Railways Company, tower truck for Rochester, N. Y.; Cleveland Electric Illuminating Company, Cleveland, O., 10 three-ton trucks; United Illuminating Company, New Haven, Conn., 1500-pound truck; United Gas Improvement Company, Philadelphia, Penn., five-ton special drip tank truck; Atlanta Gas Light Company, Atlanta, Ga., five-ton combination flusher and sprinkler, road roller, asphalt distributor truck; Sioux City Gas and Electric Company, Sioux City, Ia., one 1½-ton truck; Utah Power and Light Company, Salt Lake City, Utah, 1500-pound truck; Southern Bell Telephone Company, 1½-ton truck; Cumberland Telephone and Telegraph Company, five trucks; Southern Indiana Telephone Company, one 1500-pound and one 1½-ton truck; Central Union Telephone Company, three 1500-pound trucks and one 1½-ton truck for Indiana, two 1½-ton trucks



Trucks Equipped for Telephone Service: Upper Centre, Single Drum Power Winch Truck Operated by the Cincinnati and Suburban Bell Telephone Company for Handling Reels of Cable; Lower Centre, Special Truck Designed for Carrying All Equipment Used in Construction; Lower Left, Interior of the Truck Shown at Lower Centre; Lower Right, Tower Truck Used by Massachusetts Northeastern Street Railway Company.

which special equipment is built would require almost unlimited space, for some of the companies have combined in one or two machines apparatus that was never before utilized, and which are still practical because of the power that is available.

But while there has been very diversified use of motor trucks, and some really remarkable developments in point of equipment, one must admit that the machines have by no means reached the limit of possibilities, and specialization to a much greater degree is not only probable, but certain. In fact, with the very rapidly increasing demand for the utilities that these companies control and the very much larger communities that they will serve becoming more and more insistent, the requirements of the companies will only be met by still better specialization.

for Ohio, and one 1500-pound truck for Springfield, Ill.; Dakota Central Telephone Company, one 1½-ton truck; New Bedford Gas and Edison Light Company, New Bedford, Mass., one 1½-ton truck; Lincoln Telephone and Telegraph Company, Lincoln, Neb., one two-ton truck; Home Telephone Company, Goshen, Ind., two 1500-pound trucks; Georgia Railway and Power Company, three 1500-pound trucks; New York Telephone Company, New York, N. Y., eight 1500-pound trucks; Philadelphia Electric Company, Philadelphia, Penn., one two-ton truck; Southwestern Telephone and Telegraph Company, St. Louis, Mo., three 1½-ton trucks; Des Moines City Railway Company, Des Moines, Ia., two 1½-ton trucks; New Haven Water Company, New Haven, Conn., one 1500-pound truck; Bridgeport Hydraulic Company, Bridgeport, Conn., one 1½-ton truck; Blackstone Valley Gas and Electric Company, Woonsocket, R. I., one 1½-ton truck; Central Hudson Gas and Electric Company, Poughkeepsie, N. Y., one 1½-ton truck; Cumberland Telephone and Telegraph Company, New Orleans, La., two 1500-pound trucks; Potomac Electric Power Company, Washington, D. C., two 1500-pound trucks; Public Service Corporation of New Jersey, Newark, N. J., two 1500, four 1½, one three and one five-ton trucks; Southern Utilities Company, Jacksonville, Fla., one 1½-ton truck; Indianapolis Telephone Company, Indianapolis, Ind., one 1½-ton truck; Tifton Ice and Electric Company, Tifton, Ga., one 1½-ton truck; Southern New England Telephone Company, five 1½-ton trucks; New England Telephone Company, two 1500-pound trucks; Sanford Ice and Water Company, Sanford, Me., one 1½-ton truck.

# The MOTOR TRUCK

*Devoted to Motor Driven Business  
Vehicles of all Classes*

Pawtucket, R.I.

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## CHAIN STORE DISTRIBUTION BY TRACTOR.

**Thos. Roulston, Inc., Brooklyn, N. Y., Operating 201 Grocery Stores on Long Island, Delivers Stock Outside of a Nine-Mile Radius and Up to 60 Miles by Tractors and Semi-Trailers That Save \$10 Each Daily.**

**T**RANSPORTATION cost does not necessarily establish market prices of commodities, but it does more or less influence them, according to the distance between the places of production and sale. It is as essential a factor in making market prices as the cost of labor, material, overhead, advertising and selling. While production expense cannot be the same in all sections of the country because of local conditions, and there is no probability that it can ever be uniform, the cost of freightage, though not in direct ratio to the distance transported, must depend upon the length of haul and the volume of shipment.

The great problem of today with industry is to reduce the cost of distribution so that the market may be broadened so far as possible, and this is true no matter whether markets be comparatively limited or world wide. What is true of industry is also true of commerce. Great combinations of capital and producing facilities have sought to minimize production cost through obvious economies, some even seeking to control manufacture and sale, but transportation expense has increased steadily so far as railroads are

concerned, despite economies of scientific operating.

Though industry has sought to generally lessen production expense, many commercial interests have organized for better means of distribution within zones in which their activities are justified, but these have different conditions to meet in that there is locality competition and a desire for personal attention that is

inherent with all buyers. These organizations undertake to do on large scale what must be done by a considerable number, in ratio to the volume of business transacted. This is particularly true of those concerns which deal in food products and which seek to unite what might be regarded as the business of the wholesaler with that of the retailer, making purchases in large volume and distrib-



The Office of the Shipping Department of Thos. Roulston, Inc., on the Platform of the Covered Combination Receiving and Loading Yard.

uting to stores where sales are at retail.

### The Chain Store Enterprise.

These are known as chain store enterprises, which have large warehouses in which goods are stored or prepared for market and from which the stock is shipped as required to places for retail sale. There are more of these handling food products or groceries than





**The Broad Loading and Receiving Platform of the Warehouse in the Covered Yard of Thos. Ronlston, Inc., Where the Stock Is Received Largely by Trolley Freight and Sent Out in Wagons and Tractor-Trailer Outfits.**

any other class of business, and while in one instance at least a company has stores in cities and towns covering a number of eastern states, the majority of them are located in the large cities, from which as centres distribution is made. Logically, the greater the number of stores in a single community the less will be the cost of distribution, but the undoubted economy of quantity purchasing and lessened overhead justified expansion because the expense of distribution can be minimized by careful organization and system. By this is meant that the stock of a chain store can be maintained from a warehouse cheaper than an individual owner can maintain a similar stock purchased from different wholesalers, who must make delivery of whatever orders may be received without regard to the possibilities of distributing economically.

There are numerous other factors that are worthy of consideration aside from the fact that the chain enterprise will purchase in accordance with its needs and at prices that are as low as the largest buyers can obtain, and its shipments from production points are made at rates correspondingly low. To state the condition in another way, the chain store company is a wholesaler and retailer in a single organization, which has not only eliminated the expense of selling to its units, but can sell at lower prices and yet make as large or even larger profits than the individual retail store.

The policy of chain store companies is usually concentration in one large community and its suburbs to obtain the advantages of whatever advertising is done and to minimize the expense of distribution of stock, as well as

to afford a better degree of supervision, but practically in every instance such concerns have extended their operations from their warehouses as far as distributing expense has seemingly justified. One must understand that such companies must of necessity consider the expense of available transportation of every character. There is little probability that they can obtain preferential rates from transporting companies and must depend upon minimizing cost of freight or express by manner of shipping.

Such stores as are operated do not as a rule have large stocks, but these must be maintained at stand-

ard, which necessitates constant distribution rather than large volume less frequently. Handling and haulage with these companies means expense that is a surprisingly large item of operating cost, and when to this is added the free delivery demanded by a considerable part of the buyers, transportation becomes even more important.

#### **Unit Store Generally Small.**

Chain stores that sell food are usually small, such as may be operated by from three to five men and one or two boys. They are not often in principal thoroughfares, but are generally located in residential sections, where they will meet the requirements of comparatively small zones. The purpose is to convenience the people by carrying standard stock and various specialties, to make prompt delivery, to have the stores open early and close late, and to establish prices that will be at least at parity with those of competitors.



**Loading the Semi-Trailer Bodies: Ten of These Are Operated with Six Tractors, Coupling and Uncoupling Taking About Five Minutes; the Machines Must Stand When Delivery Is Made at the Stores.**

Increase of the proportions of the stores is not believed wise, for establishment of additional units is the logical character of growth and experience has taught that delivery over wide areas is extremely expensive. Not only this, each store can be depended upon to develop constant business where the best delivery organization would merely serve occasional customers. In this sense the concentration of patronage of the zone served by each store is especially desirable. That is to say, each store ought to develop business within a recognized zone to the greatest degree possible and there is no limitation of this development, though the store may be small. The quality and character of the stock and the service and convenience as well as the prices are all potent factors in attracting business.

#### **Systematic Distribution Necessary.**

Chain store operation necessitates the distribution of the stock to the stores from the warehouses, and the delivery of goods after these have been sold. Economy of handling is imperative, for one can understand that the item of labor would reach a very large aggregate if the stores were numerous. Besides this distributing and delivering there is, with rare exceptions, the haulage of the stock to the warehouses from the railroad and shipping terminals. Assuming that the company is of the usual class with reference to transportation: The goods received at the terminals are unloaded from the cars or vessels and placed in the freight houses.

The first handling is when they are loaded on vehicles for haulage, the second when they are unloaded on the warehouse platforms or floors, the third when they are taken to the special sections of the warehouses where they are stored, the fourth when the goods are selected to fill the requisitions for stock, the fifth when they are loaded for distribution to the stores, the sixth when they are unloaded, the seventh when they are arranged for display or convenience in selling, the eighth when they are sold and the orders made up, the ninth when the orders are taken out for delivery and the 10th when delivered at the homes of the customers from the vehicles. This summarizes only the necessary handlings and does not include those that may be desirable because of unusual conditions. Not infrequently several additional handlings may be needed.

The foregoing statement, which does not consider the various handlings or haulage incidental to production, storage and shipment prior to being placed in readiness on the floor of the freight houses, will demonstrate that labor and transportation are much larger factors in making the prices than might be believed, and any reduction of the number or work of these

handlings is well worth undertaking.

#### **Operates 201 Stores on Long Island.**

Thos. Roulston, Inc., a company that operates 201 stores on Long Island, N. Y., the chain extending from the one end of the island to the other, and which has its executive offices and warehouses in Brooklyn, has attacked the problem of haulage from two angles with the purpose of minimizing the transportation and handling expense incident to placing its stock in its warehouses and in distributing it later on to the stores. The stores at the eastern end of the island are at Greenport on the north shore and Southampton on the south shore, which are distant respectively 106.3 and 98.6 miles by the most direct roads to the warehouse, but the stores that are given tailboard delivery from the warehouse are at Sayville, 53 miles out on the Merrick road on the south shore, and at Port Jefferson, 59.9 miles out on the north shore. The stores east of these two points receive stock by freight and express, the shipments being by railroad.

The greatest number of stores are, of course, in



**Line of Tractors with Semi-Trailers Loaded Saturday Afternoon Ready to Leave the Warehouse Monday Morning; This Is the Only Time in the Week When the Machines All Leave Together.**

Brooklyn, there being 160 of them in that city and its suburbs, but 41 of them are in the different towns and villages along either side of Long Island, with a few in colonies between the two shores. These villages have permanent populations, of course, and they are increasing rapidly, but each summer there is an influx of city residents who reside in them for varying periods, as well as the vacationists, so that from April until well into the autumn there is a considerable part of the dwellers whose requirements must be met as well as those of the constant inhabitants.

#### **Company Was Organized in 1907.**

The stores are not established in small villages, for the purpose is to locate them in communities in which profitable patronage can be developed and retained. The company was organized in 1907 and the first store was opened in Brooklyn. This was conducted as is the average retail grocery, but the possibilities of other stores were soon realized and a policy of development and expansion was determined which has been followed consistently.

While the greater number of stores are in New York City no unit of the chain has been established in Manhattan, the Bronx or Richmond. Thus far the chain has been confined to the boroughs of Brooklyn and Queens and the East river has not been crossed. But there is no question that Long Island has been very intensively exploited and the company is today by far the largest concern of the kind engaged in business in Brooklyn. The stores in Brooklyn are not necessarily widely separated, but they are located with reference to the business possibilities. All are telephone connected and, differing with the policies of many companies operating chain stores, delivery to customers is made, either by horse wagons or by push carts. Horses are kept in stables close to the stores. The deliveries with the push carts are made by boys.

Endeavor is made to keep the deliveries within the zones of "reasonable distance" so that customers shall not be kept waiting for the service that might be demanded by patrons who moved from one zone to another and seek to continue purchasing from the store in the zone in which they had resided. Such custom-

covering a winter, spring and summer, affording very accurate knowledge of the distances loads were hauled. The average work was approximately 70 miles for the week, or about 11½ miles a day. Investigation into the limited mileage showed that the time of the teams, wagons and drivers was largely taken up in loading and unloading, and as each load taken out was made up of packages, boxes and barrels, these could not be selected and handled quickly, especially as a freight for a number of stores must be loaded in reverse of the order of unloading so that it could be unloaded without loss of time at the stores.

The experience of the company was not different than that of hundreds of concerns utilizing animals. There was a great deal of lost time with each wagon or cart, that seemingly could not be reduced, for no matter how carefully the warehouse handling was planned or organized there was little if any improvement and there was no reason to expect much gain in the delivery. But this study of haulage was beneficial in that it minimized lost time and obtained what might be regarded as maximum results from the facilities

and equipment. At that time the company had as a warehouse what is now used as a loading yard. The building was erected in Ninth street, near Second avenue, it being a single story structure. When it was planned the purpose was to utilize it for storage until there was need of considerably increased facilities and then erect a larger building and convert the temporary warehouse into a loading house. From this fact the reader will understand that transportation was then receiving much greater attention than was usually given



**The Tractor Train in Front of the Roulston Stables About to Leave for the Suburban Stores, One Trip Being 145 Miles, Each Carrying Six or More Ton Loads.**

ers are notified that they can obtain the same attention and satisfaction at the nearest store. This minimizes the expense of delivery and releases the wagons or carts so that the greatest utility is obtainable. This statement indicates the character of supervision exercised over the delivery of every store. The attention given is necessarily close, but the results accomplished have justified it.

#### **Wanted to Economize Haulage.**

After the company determined that it would develop a chain of stores a warehouse was a necessity and to this the stock was originally hauled from the railroad and shipping terminals by horses and carts, and from the warehouse distribution was made by similar equipment. The need of economy in haulage was realized and record was kept that there might be basis on which to develop economy and efficiency. The first object was to reduce idle time and utilize the animals to the greatest degree possible. The tonnage hauled was easily obtainable, and to learn mileage a number of wagons were equipped with recorders of the tape registering type that were used for 10 months,

by the average business house.

#### **First Truck Bought in 1913.**

The company bought its first truck, which it proposed to use for experimental work of all kinds, in 1913, there being considerable confidence in the economy of larger loads and greater speed, but because of the increased capacity more time for loading was required and making two trips a day there was approximately four hours of idle time daily. This meant a distinct loss when the operation period of each day could not be more than six hours without working the truck crew longer than those working with horses. The company was at that time using horses for haulage of all kinds, and maintained a large stable close to the warehouse, while the animals and the wagons attached to different stores were kept at stables in the vicinity of the stores.

Horses were believed to be more economical than trucks for work within a given radius of the warehouse, but outside of this radius, where stores could be profitably operated, the animals could not be used because of the length of the haul. Nine miles from the

warehouse was regarded as practically the limit for economically working horses. The hope was that the truck would be an economy for this haulage, but the greater loading time limited it to two trips a day. When the truck had been worked until its utility had been determined, General Manager T. H. Roulston decided that this would not serve with the measure of economy that might be obtained with other equipment, and he resolved to experiment with a tractor with semi-trailer bodies, and to load these so that the tractor could be kept moving with no waiting aside from making delivery, and there would always be a loaded trailer ready to be taken out.

#### First Tractor Haulage in 1914.

The company bought a three-ton Garford chassis in March, 1914, which had a short frame and was designed for use as a tractor, and two horse trucks were converted into trailers by removing the bolsters, front springs and turntables and front axles, and installing Shadbolt patent fifth wheels, the upper parts of the fifth wheels being mounted on the semi-trailers and a lower section on the chassis. Raising and lowering the forward ends of the semi-trailers to uncouple or couple them from the tractor was a problem that was experimented with and was carefully studied before the use of hydraulic jacks was decided on. This determination was reached because such equipment would save time and labor and was positive and dependable from every aspect.

The work with the tractor was found to be in every way economical. No haulage done with it was so quickly done that a trailer could not be loaded and in readiness for another run immediately upon return, but there was necessity of having the men who loaded the trailers go out with them to make delivery, for they could do the work much more quickly than those not familiar with the freights and their destinations. This meant that the driver of the tractor did the driving and gave whatever assistance was necessary to the "trailer man," as the man who does the loading is known, and this required a crew of two to each tractor. Were this method not adopted the driver would have to give time to supervise the loading as well as requiring a much greater allowance for unloading. In one sense the "trailer man" is idle while on the road, but he must load the trailer as well as unload it, and as he is conserving the time of the machine there appeared to be greater economy in this plan than any other.

#### Development of Facilities Planned.

During the time of experimentation with this tractor plans were further developed and these eventually resulted in the organization of the system and the construction of the facilities that are now utilized. One

part was to increase the equipment for haulage to meet whatever demands were realized, another was to erect a great warehouse that would suffice for a considerable period of time, and a third was to minimize the haulage to the lowest possible point. Without dealing with the development of these and the results from experiment, what is now available will be described.

A four-story brick, stone and steel warehouse was built on property adjoining the single story warehouse, and when this was completed the latter was converted into a covered loading yard, this being done by constructing a platform the full length of the side next the warehouse. On this platform is an office for the shipping superintendent and there are six wide doors communicating with the interior of the warehouse, which are closed by fire doors when not in use. This platform is wide and spacious and is the height of the floor of a truck or wagon body, so that there is no need of lifting or lowering goods save when actually packing them for the stores served by the tractors and semi-trailers and handling can be quickly done.



All Freight from Railroad Terminals Is Received from the Bush Terminal by Trolley Cars, This Obviating All Haulage to the Warehouse Save from Docks and Piers.

As practically all of the stock consigned to the company, aside from that shipped by water, is received from the railroads at the Bush terminal, a contract was made with the Brooklyn Rapid Transit Company for the delivery of this freight at the warehouse. A spur track from the street in front of the warehouse was constructed into the covered loading yard or shed and extended the full length of the platform so that cars may be run into it and unloaded directly at the warehouse platform. Four or more cars can be unloaded at one time. Under the contract all car load shipments are sent to the warehouse without delay, and less than car load shipments are accumulated until a car can be filled. Then delivery is made, and the cars go and come during the part of the day the warehouse is open. Only green coffee and tea, which are received by ocean freights, and shipments from the South by steamers, are hauled to the warehouse by the company's vehicles.

The three lower floors of the warehouse are used for storage principally. It has refrigerating rooms for the stock that might be affected by high temperatures,

such as butter, cheese, lard, eggs and the like, and there are divisions in which are prepared bottled and package products. On the upper floor is a large office and the department where coffee is roasted and packed. Two freight elevators are used for taking stock as it is received to the upper floors, and these are also used for taking it to the lower floor when it is to be sent out. For handling the stock four-wheeled hand trucks are used that can be rolled on or off the elevators.

#### How Stock Is Distributed.

As the stock is received it is placed in different sections of the building, where it is readily available when wanted. Requisitions from the stores for stock are made in duplicate in the office and the copy is sent to the shipping department. The requisition is given to a stock man to collect, and the articles are gathered in boxes or barrels without special packing, the main purpose being to obtain easy handling in the warehouse and trailer until delivered. The sugar and coffee and tea and some other articles are packed in con-

Now as to the haulage equipment: The first truck bought was a three-ton chassis, which was converted so as to have with its semi-trailers load capacity of from five to eight tons. In 1914 three more were purchased and these, too, were equipped with converted horse wagons. In March, 1915, the next machine was bought, and May 20, 1915, another tractor and a one-ton Garford truck were added, this making a total of six tractors and a truck. These last two tractors were equipped with special built semi-trailers, these being constructed by the Shadbolt Manufacturing Company. The converted wagons were strengthened and fitted with wider tires to the better endure the heavy loads.

All of the trailers have load capacity that is rated as five-eight tons, save one machine, which has a 10-12-ton trailer. There are 10 semi-trailers in all in use. In coupling and uncoupling these from the tractors about five minutes is the average time required. In the loading yard five hydraulic jacks are used, three of which are mounted on hand trucks and can be

drawn about quickly and easily located. After the trailers are jacked for uncoupling they are usually supported by wooden horses while loading, as this makes for greater safety and insures against accident, because there is insecurity if the forward end is maintained at one point only.

The average load for a semi-trailer is about six tons, though occasionally the freights will somewhat exceed that figure. The general purpose is to have each tractor make one long and one short trip a day, which are so arranged that there will always be loaded trailers ready when the machines return, and one might assume



Garford Three-Ton Tractor with a Semi-Trailer Converted from a Horse Drawn Truck, That Has a Load Capacity of Eight Tons.

tainers that are sealed, these usually being large tins contained in crates. When the stock called for by the requisition is gathered it is taken on the trucks to the lower floor of the warehouse, where it is held until a trailer is in readiness, when it is loaded. As stated, the loading of each trailer is done by the man who will make delivery, and the arrangement is such as will best convenience him when unloading.

With this method of making up orders and loading the work in the warehouse is extremely well systematized. The gathering of stock and the loading can go on without congestion or cessation and a smaller force of men can be used than were there alternating periods of hustle and inactivity. The work is better done as a whole and as will be noted the handling is materially reduced. Aside from the water shipments one handling and one haul are eliminated as compared with receiving at the railroad terminals, which is a considerable economy. That there could be greater reduction is seemingly improbable.

that the average would be 12 tons freight daily for each tractor, though such a run as to Port Jefferson, which is 145 miles, and which will require from 12 to 14 hours, according to conditions, is a big day's work for any vehicle. On this run the stops are at Islip, 48 miles; Patchogue, 60 miles, and Port Jefferson, 76 miles, and the load must be taken off and checked. Returning the tractor must stop at these stores and take on empty boxes, barrels, etc., and frequently the freight will weigh a ton or more. These containers are too valuable to be destroyed and are brought back to the warehouse as long as they may be serviceable.

Taken as an average the mileage of the tractors and trailers is from 56 to 60 daily and at this season of the year is probably in excess of these figures. The average day's mileages of the machines for two consecutive months are 47-57, 65-64, 66-56, 65-52, 61-49 and 60-59. These gave an aggregate of 337 miles a day for the six tractors and an average of 56.15 miles for



the first month, and an aggregate of 362 miles a day and an average of 60.33 miles for the second. The mileages of the semi-trailers are much less, but the figures on the work of these are not of special importance. One very interesting item is the mileages of the tractors to the gallon of gasoline, and taking the figures for January and February of this year the average consumption was 3-3.47, 3.50-3.33, 4-2.80, 3.20-2.72, 4.30-3.12 and 3.20-3. As these were of two of the most severe months of the winter, and there was more snow during that period than normal (in fact more than for 30 years), the consumption for the greater part of the year is considerably less.

#### **Some Operating Economies.**

The results with tires is very interesting. The tires are as a rule guaranteed for 7000 miles, and despite the heavy loads the average mileage obtained is from 12,000 to 13,000 miles. In some instances these figures have been exceeded, but in others they have not been reached, so that the average stated will fairly represent the results. The machines are depreciated fully in three years, the value being written off at the rate of 50 per cent. for the first year and 25 per cent. for the second and third years. This policy increases the operating expense materially because of the heavy depreciation charges, especially the first year, but there is reason to believe that the tractors will endure much longer than the three years, and when the period for depreciating has elapsed there will be lessened expense, even with logical increase of maintenance cost as the machines wear. General Manager T. H. Roulston states that the average operating cost of his tractors and semi-trailers is \$19.10 a day, and with this vehicle expense the principal purpose is to keep the machines moving as much of the time as is possible.

This is done systematically and with the means in use for quickly coupling and uncoupling the trailers from the tractors there is very little lost time. Where the conditions are favorable the tractors will average more than 10 miles an hour and each one can be handled in traffic almost as easily as a truck, so that there is comparatively little loss of relative road speed. One will assume that 10 miles or more an hour is fast for heavy laden trailers, but on the long runs and over good roads the tractors can exceed that rate if there are not many stops made.

#### **How the Loads Are Sent Out.**

Each Saturday afternoon six trailers are loaded, and at six every Monday morning the tractors are sent away and the remaining trailers are loaded while they are absent. At least two of the trips are long and the

others are so arranged that the four trailers will be ready when the tractors return, and the empty trailers brought back are then loaded for short trips. On the returns of other trailers these are loaded in readiness for the following day. The remaining five days of the week the drivers report at 7 o'clock and the same plan of distribution is carried out. The tractors are used so far as is possible, but on the short hauls, and even to Coney Island horses are used. The company now has about 50 horses in service.

The distribution is so planned that there is generally one spare or reserve tractor and trailer outfit to meet emergencies, but to handle demands for special supplies a ton truck, a Garford, is kept in readiness and it can be quickly loaded and sent out if the order cannot be supplied by the regular tractor and animal service.

#### **The Facilities for Maintenance.**

The garage is adjacent to the warehouse and it was a stable that has been converted to house the ma-



**The Roulston Garage, Which Has Capacity for 25 Machines and Is Now Operated by a Working Superintendent and Two Mechanics for Normal Maintenance.**

chines. It has a capacity for a considerable number of machines in excess of the present equipment and is equipped with the necessary hand tools and a stock of parts and supplies. The garage is in charge of a superintendent who also has charge of the mechanical work and he has two men working with him. He is responsible for the vehicles being in operative condition and he has a small runabout in which he responds to calls from drivers who may have inoperative machines. On learning a condition by telephone he puts what tools and parts are necessary into the runabout and drives where the disabled tractor is stalled.

Should there be occasion for towage one of the other tractors can be reached by telephone on their routes and sent to haul the stalled vehicle to the garage. Each tractor carries a towing chain that is tested to 10 tons, a jack that will lift 15 tons, and a shovel, so that in the event of being stalled by a poor road or in snow or any similar obstruction, a tractor can be

extricated without removing the load. Because of the care in maintaining the tractors and the system of "team work" in the event of accident there are very few delays of consequence and the service is extremely reliable.

#### **Saving More Than \$18,000 a Year.**

Summarizing the service one will understand that outside of the radius in which horses are used, and to a distance in a straight line of 60 miles, distribution is made to all the stores by tractor, but beyond this the supplies are sent by freight or express and handled as they would be by the average store that merely had delivery equipment. According to Mr. Roulston the saving realized will approximate \$10 a day for each tractor, or \$60 a day, or in excess of \$18,000 a year, and the total cost of the equipment is about \$30,000.

The drivers are all experienced men, who can do whatever is necessary in the way of keeping their machines operative on the road. They are paid stated wages weekly, with overtime, and are supplied with supper money whenever they work until 8 o'clock in the evening. As a rule there are periods when the full day is not worked, such as Saturday afternoon, but there are occasions where they will work longer than the customary 10 hours, and in this manner the time worked will average a given number of hours weekly.

There is probability that the number of stores in the area now served by the tractors will be increased, which will entail additional machines, but whether the routes will be extended is a question. The return trips must be made over the outgoing routes because of the collection of the containers in which the stock is taken out, and this extends the mileage considerably when the trips are long, such as that to Port Jefferson, for instance. Perhaps with greater experience and as conditions change there will be a more satisfactory way of handling the containers, but until this has been devised there is no probability that the method of distribution will be changed.

The result of the system is the saving of at least \$18,000 a year that would otherwise be spent for distribution, and the stores are better served. This is equal to a return of six per cent. on an investment of

\$300,000, and there is no reason why this economy cannot be increased as greater experience is gained and the organization and methods are perfected.

#### **PACKARD MEN RE-ENLIST FOR MEXICO.**

Having served for three months in the United States motor transport service in and below the Mexican border, O. J. Stevenson, truck master, and W. G. Richardson, assistant truck master, returned to Detroit. Almost on their arrival there they learned that the government had ordered 396 Packard motor trucks and a sufficient number of drivers and mechanics to operate them, and both men lost no time in placing their names on the government contract calling for one year's service and started South with the first shipment of trucks.

#### **FIRE APPARATUS IN SOUTH AMERICA.**

The fire department of Guayaquil, Ecuador, which is well known throughout South America for its efficiency, is equipped with the most modern American apparatus. Recently addition was made to the equipment of a Brockway with a four-cylinder, 35 horsepower motor and a chemical apparatus of 25 gallons capacity with 200 feet of hose.

#### **SEVERE MOTOR TRUCK TESTS IN MEXICO.**

Every motor truck manufacturer in the United States has had opportunity to place his vehicles in army service in Mexico to demonstrate their efficiency and the men in charge of these machines agree unanimously in the opinion that the work has proven the severest test that any truck could be subjected to.

#### **MOTOR DELIVERY LESSENS COMPLAINTS.**

Berg Brothers, operating one of the largest department stores in Philadelphia, Penn., after installing in its delivery service a fleet of six Vim wagons, found that the complaints from late and missed deliveries decreased 75 per cent. The store had used the delivery service of a contractor which had operated with horses, and non-deliveries and late deliveries were a constant source of dissatisfaction among the customers. The Vim wagons each replace two teams of horses on short trips and equal three two-horse teams in this service on long hauls.

The store management also found that through the use of motor delivery wagons it had greatly increased the area of convenient delivery, a fact which greatly stimulated trade from suburban residents.



Three Eras of Road Transportation: At Left a Gramm-Bernstein Truck, at Centre a Team of Horses and at Right a Team of Oxen.

## STERLING COMBINATION CITY SERVICE TRUCK.



Combination 1200-Gallon Tank and Dump Body Equipment on Five-Ton Sterling Worm-Driven Chassis for City Service.

**A**N APPARATUS that is especially designed for municipal service and which is interchangeable with a body and power hoist equipment, is fitted to Sterling five-ton chassis by the Sterling Motor Truck Company, Milwaukee, Wis. It is intended for applying oil to highways during the period when dust suppression is necessary, and the remainder of the year the chassis and dump body may be used for other work. The change of the apparatus and the body can be made in a short time and at small cost.

The equipment consists of a sheet steel oil tank having 1200 gallons capacity and fitted with baffle plates. Tubes extend longitudinally through the bottom of the tank and heat from four burners under the tank circulates through these. The heating capacity will liquify any bituminous compound in the tank so it will flow freely, and any degree of temperature can be maintained without regard to weather conditions. The burners are supplied with kerosene and the discharge from the flues is from a vertical stack at the rear and top of the tank. The heating chamber is lined with asbestos.

The tank is filled or discharged by a rotary pump that is driven by two silent chains from the secondary shaft of the transmission gearset, but by an independent shaft and it is controlled by an individual clutch. The pump makes about 150 revolutions a minute to about 950 revolutions of the engine. All oil from the tank passes through a strainer before entering the pump, and while filling all the oil is sent through the strainer before reaching the tank.

The oil distributing system includes two rows of nozzles at the rear of the chassis, the discharge from which is regulated by an operator who sits at the rear. The nozzles have lateral movement of about six inches each side of the

centres and can be folded when not in use. The distributing area is eight feet wide. The nozzles are designed to deliver from  $1\frac{1}{4}$  to  $1\frac{1}{2}$  gallons to the square yard of surface when the truck is driven  $2\frac{1}{2}$  miles an hour. The system is connected with a kerosene tank so that the nozzles can be cleaned by flushing them under pressure. A semi-circular drip pan is carried that is swung under the nozzles when the pump is stopped, and this serves as a windshield when the oil is being applied. The discharge pipe is connected with a by-pass valve so located that when

the nozzles are closed the oil is circulated back to the tank. This also insures a circulation of oil while the contents of the tank is heating and affords uniform consistency.

### F-W-D SERVES U. S. FIRST.

Thirty-eight F-W-D trucks recently became involved in a spirited contest between the United States government and British government officials. The trucks were aboard a train at Clintonville, Wis., the city in which the Four Wheel Drive Auto Company's plant is located, ready for shipment to New York and thence abroad to England. Before the train started, however, there came an urgent request by telegraph from the War Department at Washington for 40 F-W-D trucks for Mexican service. After a conference between all parties concerned the F-W-D officials decided the United States need was greater than Great Britain's and dispatched the machines toward the Mexican border, the other two machines required to complete the order going forward the following day.

The Gramm Motor Truck Company, Lima, O., maker of Garford trucks, has increased its capital from \$2,500,000 to \$5,000,000.



The 38 Four Wheel Drive Trucks, Built for European Army Service, That Were Sent to the Mexican Border at Uncle Sam's Behest.



Six-Cylinder Wisconsin Engine Used to Drive Air Compressors of Portable Plant for Operating Pneumatic Drills and Hammers.

### GOVERNMENT CALLS ON F-W-D FOR HELP.

Employees of the Four Wheel Drive Auto Company, Clintonville, Wis., were compelled to abandon their plans for celebration the Fourth of July when just before closing time on the afternoon preceding a telegram requesting 53 men to man F-W-D trucks immediately in Mexico was received from the War Department in Washington. The F-W-D vehicle is not difficult to operate or maintain, it requiring no more than average mechanical skill, but nevertheless the men went willingly to work, testing machines and drilling for army service until late in the afternoon of the Fourth, at which time they left Clintonville for the border. It is reported from Mexico and the Texas border that the F-W-D trucks are giving excellent service in the rigors of army use.

### PORTABLE AIR COMPRESSOR PLANT.

A portable air compressor plant, that may be taken from one work to another and worked for any desired period, either intermittently or continuously, is in use in Los Angeles, Cal., and has attracted much attention because of the utility and economy of the outfit. The apparatus is shown in the accompanying illustration. It consists of a six-cylinder Wisconsin engine having bore of  $5\frac{1}{4}$  and stroke of seven inches, that is driven normally at 800 revolutions a minute. This is used to

furnish the power for driving two double six by six-inch Rix Gardner air compressors that have a capacity of 280 cubic feet of free air a minute against a working pressure of 125 pounds.

The compressors are geared to have half the speed of the engine and usually are worked at 400 revolutions a minute. The work shown in the illustration is supplying energy for pneumatic hammers and drills and the engine is used for 10 hours daily. The outfit has given exceptional satisfaction and has attracted much attention locally from engineers as well as those engaged in other practical construction.

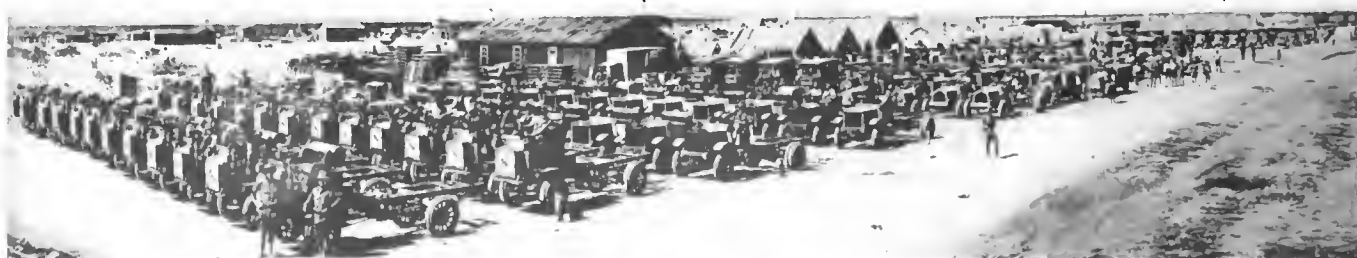
The manner of operating the engine with a reasonable load and with even acceleration whenever there is change of speed does not cause stresses such as would result from use in a road vehicle, and there is very economical expense because the fuel is much better consumed and there is minimum consumption of lubricant as well.

### INCREASED RUBBER PRODUCTION.

In 1905 the world's output of Para rubber was 60,800 tons a year, but in 1914 it had dropped to 60,000 tons. Meantime, the cultivation of rubber commenced and from an output of 145 tons it grew to 64,000 tons in 1914, exceeding the amount of Para rubber produced. It is estimated that next year's production of cultivated rubber will be 147,000 tons and that it will reach 209,000 tons by 1921.

### ACME TRUCK SALES INCREASE.

C. J. Helm, sales manager of the Cadillac Auto Truck Company, Cadillac, Mich., who has just returned from an extended trip through the eastern states, is highly pleased with the numerous repeat orders for Acme trucks. "Our dealers report the most satisfactory service with Acme equipment and owners are enthusiastic over the exceptional fuel and tire mileage obtained and the very low up-keep expense.



Motor Trucks, with a Series of Four Wheel Drive Machines in Front, Parked at the Base of the Mexican Expedition of the United States Army at Columbus, N. M. These Are Used to Transport Troops and Supplies.



Express Car Loaded with Truck Bodies Built in Pennsylvania Being Unloaded at the Receiving Yard of the Packard Motor Car Company at Detroit. The Platforms and Sides Are Shipped "Knocked Down," and Are Fitted to the Machines at the Factory.

### GOVERNMENT ORDERS HAVE PRECEDENCE.

By the provisions of the new army bill, which became a law on June 3, 1916, manufacturers in national emergencies must give over all other work to army orders. This law was recently invoked among motor truck manufacturers, and as a consequence the Packard Motor Car Company has prepared special stickers calling attention to the law and is attaching these to every piece of correspondence, material requisition and memorandum having to do with the trucks the company is making for the War Department. The truck division of the Packard plant is being worked 24 hours daily and shipments of truck trains, consisting of 33 vehicles each, are going forward with remarkable rapidity.

### SEVEN MILES FROM A CHARGING PLANT.

Operating an electric truck without owning battery or charging apparatus is not only practical, but is being adopted by business men who can instantly understand a proposition when they are informed that service will cost a definite figure for each mile driven. They use what service they require and pay for it as they do any recognized utility. The possibilities of such a service impelled George F. Richardson of Newton Centre, Mass., who operates the largest market in that city, to adopt it and abandon the use of a three-horse team for hauling his stock, or at least at large part of it, from the Quincy market in Boston, seven miles from his place of business.

The speed, the utility and the sanitary condition of the electric truck were the chief reasons for

making the change, aside from the obvious economy of the machine as compared with the animals. The truck is sent to Boston every morning and the round trip, aside from loading, requires about 45 minutes each way. The truck has the battery service system of the General Vehicle Company that is operated in connection with the Edison Illuminating Company of Boston, and in the event of emergency use an extra battery can be obtained at the Atlantic avenue station. Ordinarily a battery will serve for at least 40 miles driving, so that there is a large reserve in the event of extreme weather conditions. Mr. Richardson's place of business is

seven miles from the charging station, which illustrates the long range service that is practical with this system of battery exchange.

### "BLUE BOOK OF TRAFFIC."

The Federal Motor Truck Company, Detroit, Mich., has issued a 64-page book entitled "The Blue Book of Traffic," in which are illustrations of Federal trucks as used in more than 50 different classes of business. It also contains a comprehensive treatise on motor trucks, which is presented in a manner that is interesting to any business man who has had little experience with power vehicle delivery and haulage.

### ABBOTT TALKED ON HEAT TREATMENT.

Robert R. Abbott of the Peerless Motor Car Company gave a highly interesting talk on "Commercial Heat Treatments of Automobile Steels" at the June meeting of the Pennsylvania section, S. A. E., at Philadelphia.



Electric Truck Operated by George F. Richardson to Haul Supplies from Quincy Market, Boston, to His Store at Newton, Mass.



## HIGH FEDERAL EFFICIENCY.

### Record for Month for Oil Truck Delivery Shows Marked Economy.

Frank Ely, the driver of a 3½-ton Federal truck for the White Star Refining Company of Detroit, Mich., kept a record of the operations of the machine during the month of April of this year, which is remarkable in many respects, and is produced in part in this statement.

While the service qualifications and reliability of the machine, of course, were the principal factors in the exceedingly efficient results obtained by Ely, much credit also accrues to him through his methods of handling the truck, which included care, punctuality and brain work.

The following table gives a summary of the results:

Trips .....	3.58
Deliveries .....	15.00
Loads .....	19.770
Average load per trip.....	5.484
Ton-miles .....	20.50
Standing time at plant.....	1-25
Running time .....	8-58
Average standing time per trip.....	23
Miles travelled .....	37.41
Trip distance .....	10.41
Average speed in miles per hour.....	4.17
Miles per gallon of gas.....	4.82
Miles per pint of cylinder oil.....	20.41

A superficial glance at this table does not tell the real story, it being necessary to analyze some of the items, to put them in their true light. While the daily mileage travelled was 37.41, as shown, and the average trip distance was 12 miles, many of the trips were of much greater length, as the delivery points are located at great distances from each other. Another point is that but little time was spent at the refining company's plant, where the loads are taken on, average stopping time being only 23 minutes, or one hour and 25 minutes for a whole day. Analyzing the figures further it is found that the average delivery stop is only 22 minutes. This is a very brief stop considering that the driver in that time not only had to deliver the goods and get a receipt, but talk over with the consignee the prospects of future orders, as Ely not only

aims at giving service, but also helps build up the business wherever he goes.

Some surprise might be expressed at the figures indicating the consumption of gas and oil, but Ely overcomes this by economizing in time, as the table would indicate. He makes short stops and when he is on the road makes it a point to get from one place to another as rapidly as possible. In the matter of cylinder oil consumption the record is considerably higher than required, as Ely added two pints each day, which kept the oil level higher than necessary. It is claimed that this consumption of oil could be practically cut in half by feeding the oil only as it is required and that an average of nearly 40 miles should be made on each pint.

## INCREASED FUEL OIL PRODUCTION.

In commenting on the present situation in the petroleum industry, the July issue of "Oildom" states that the increase in the flow from the wells each month, while not large, is reaching a point where it may have an influence on prices. The runs from the wells in May showed an increase of 107,653 gallons as compared with January of this year. These figures cover the fields east of the Mississippi, while in Texas in the Humble district the production increased from 50,000 to 100,000 barrels a day within the past 12 months. It has been estimated that 10,000,000 barrels of oil is stored in the Texas and South Louisiana fields. Six months ago the stocks averaged about 8,000,000 barrels and previous to that about 5,000,000 barrels from year to year for the past five years.

## LIQUID MEASURING PUMPS.

F. L. Schlink, assistant physicist, United States Bureau of Standards, read a very interesting paper on "Liquid Measuring Pumps" at the 11th annual conference of Weights and Measures of the United States.

After describing the mechanism for measuring used in the various types of gasoline dispensing pumps, the speaker pointed out the various methods of testing and inspecting apparatus to see if they accurately registered the amount of oil delivered. He also recommended that the design of piston type measuring pumps should prevent operation through less than full strokes without that incompleteness of the cycle being clearly indicated to the customer, and that in order to prevent the short deliveries consequent upon operating the piston pumps at less than full stroke, a placard to read "This pump to deliver so many gallons for each full stroke."



Federal Three-Ton Truck Operated by the White Star Refining Company at Detroit, Mich., for Comparatively Small Expense.

**CARRY GOODS TO CUSTOMERS.**

Operating with a motor truck carrying a general stock of common necessities and exchanging it or selling it to customers who reside in the country is an unusual business, though it is engaged in with considerable success by clever men in different parts of the country, but Fred P. Ray of Bangor, Me., perfected this idea and specializes on men and women's wearing apparel, which he displays and sells from a motor truck store. Mr. Ray has been in business for six years and his operations were limited by the endurance of the animals he drove. He would probably never have realized the fullest possibilities had not a Chase truck salesman suggested an equipment that he ordered, and which he maintains is all that could be desired for his purposes.

With this truck store Mr. Ray drives comparatively long distances from Bangor and besides visiting regular customers he will respond to a mail or other request and display a stock of goods at the home of the prospective buyer. The equipment is a model A Chase chassis on which is a body with lifting sizes that contains 22 drawers of varying sizes, in which goods are carried. These drawers are mounted on rolls and are movable without effort when filled. The drawers are proportioned for the character of goods they carry and the contents are thoroughly protected against moisture or dust. When the sides are lowered these are locked and the stock is secure against theft. In this body a much larger stock than might be assumed can be carried, and it may be shown with very little delay. Naturally, Mr. Ray's business has greatly increased since he is able to visit his customers more frequently, carry a complete stock and reach people within a much greater radius.

**OVERLAND DELIVERY CAR ECONOMICAL.**

Unit No. 4 of the delivery fleet of the Lion Dry Goods Store, Toledo, O., is an Overland wagon, and this machine during the past year has been operated at remarkably low delivery costs. In the past 18



Overland Delivery Wagon With Which 71569 Packages Were Distributed in 18 Months at Less Than 4½ Cents Each.

months 71,569 packages were delivered by this wagon, at an average cost of less than 4¼ cents per package. During the first six months it was operated on city routes and delivered 31,699 packages, at an average cost of .03348 of a cent per parcel. Its stops were close together and the traffic conditions were comparatively good. Later the car was transferred to a suburban route and during three summer months averaged about 2500 packages each month, at an average cost of about six cents each package. The delivery cost during August, 1915, averaged about 10 cents through the fact that a new set of tires had to be supplied. Since that time the number of deliveries increased steadily and the average cost decreased, it fluctuating between three and six cents. Obviously the cost is least when the number of deliveries is largest and the minimum is reached when the vehicle is worked hardest, though mileage is not necessarily a factor.



Carrying Goods to the Customer: At Left, the Open Body of the Motor Store Operated by Fred E. Ray of Bangor, Me.; at Right, the Truck Ready for the Road.

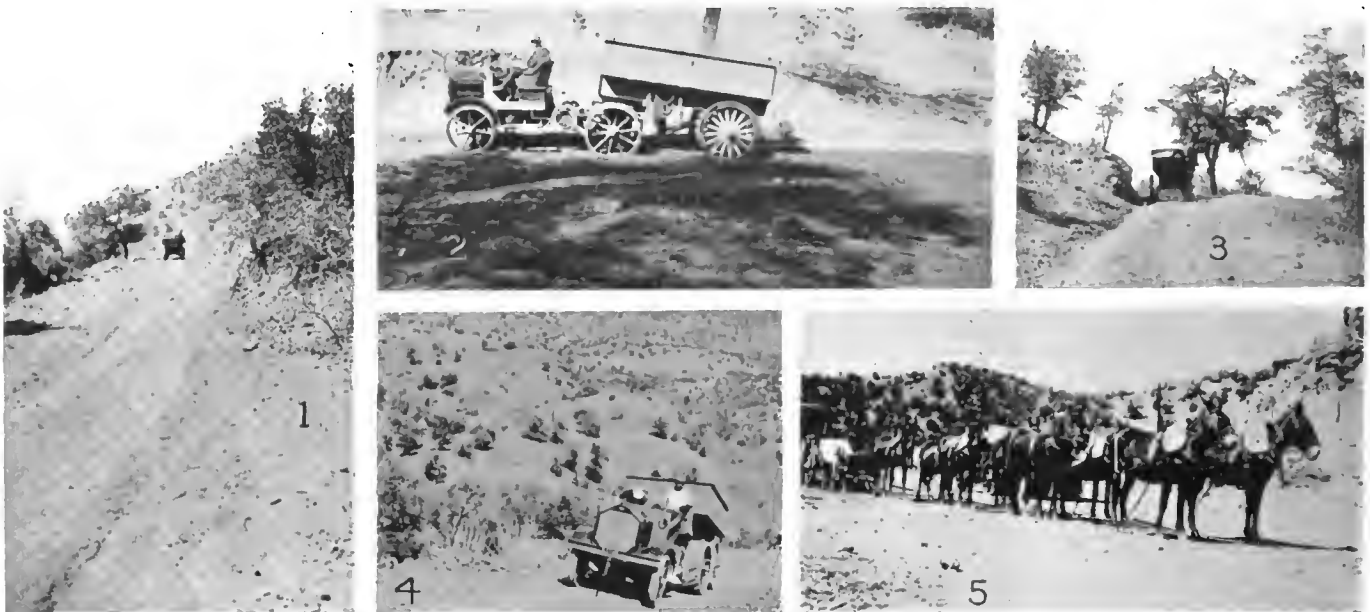
## ROAD TRACTOR ECONOMY IN MINING OPERATIONS.

**T**HE economy of motor vehicle transportation as compared with animal haulage in the mining industry has been demonstrated by the Duquesne Mining and Reduction Company of Arizona. This company uses a Knox four-wheel tractor with a semi-trailer of special design to transport ore from its mine at Duquesne to Patagonia, 18 miles away, and to haul supplies on the return trip.

Some idea of the conditions of this 18-mile trip may be had from the fact that it formerly required three days for a 10-mule team to make the round trip of 36 miles, hauling three tons of supplies of all kinds, sometimes including heavy machinery, to the mine and returning with a seven-ton load of ore. As compared with this, and to illustrate the economy of motor ve-

cluding two hills that have pitches of more than 20 per cent. with ledges of rock laying diagonally across the road in several places. Part of the way the machines had to follow up a canyon because of the absence of any semblance of a highway. Three different creeks have to be forded 64 times. The motor equipment saved the mine owners from the necessity of closing down the mine four different times in 10 days because the tractor and trailer made an extra night trip back from the Patagonia station with machinery.

The Knox tractor is steel shod throughout, and the semi-trailer rolls on broad, practically indestructible steel tires. The power wheels of the tractor are equipped with steel cleats arranged diagonally, which



Arizona Roads Where Tractor Proved Its Value: 1, "Jigger Hill," a Long, Winding Grade at Times Exceeding 20 Per Cent; 2, Crossing a Ford, (One of 64 Fords at Three Different Creeks in 18 Miles); Knox Tractor and Trailer, with 9500 Pounds Load, a Total of 23,800 Pounds, Near Top of "Rocky Hill" Ascent; 4, Tractor Starting to Climb 20 Per Cent Grade of "Rocky Hill"; 10-Mule Team and Wagon Used Before Tractor Was Purchased.

hicle haulage, it is related that the Knox tractor and semi-trailer covered the same mileage in 10 hours, hauling four tons on the trip to the mine and  $8\frac{1}{2}$  tons on the return journey. The mine owners have found that the improved method of gasoline transportation has effected a saving of more than 48 per cent.

The tractor and trailer have been under the direct supervision of S. R. Montgomery, district supervisor for the Knox Motors Associates. The loads varied considerably in weight, but experience proved that an average of 10 tons per day could be made easily. Mr. Montgomery's record of tonnage hauled shows an average of 369 ton miles over a period of six successive days, with a record of 459 ton miles for one day. The tractor hauled as much as  $5\frac{1}{2}$  tons to the mine and 10 tons to Patagonia apparently with the same ease as when lighter loads were taken.

The route of travel is exceedingly difficult, it in-

insure traction even under the most unfavorable conditions. The tractor is also provided with a differential lock which prevents the action of the differential whenever one driving wheel begins to spin. The brakes are a powerful hydraulic type and afford a high degree of braking control.

### FEDERAL INVITES INVESTIGATION.

The Federal Motor Truck Company, Detroit, Mich., has issued a circular inviting every business man to write it regarding traffic or transportation problems. The circular, which is in the form of a letter from M. L. Pulcher, vice president and general manager of the company, states that the traffic engineering department of the Federal company will be placed at the service of all inquirers to analyze and report on their haulage problems.



Four Wheel Drive Truck Hauling Trains Loaded with Material for Road Construction on Industrial Railroad.

## TRUCK HAULS TRAILER TRAIN.

### F W D Machine Used by Road Builder Instead of Small Locomotive.

**H**AULING trains of trailers on a narrow gauge track may seem to be a very strange use of a motor truck, but this manner of obtaining power has been proven very economical by the Henlon & Oakes Company, contractor, which is engaged in constructing a cement surface for the Perry Creek road, a highway north of Sioux City, Ia. One might assume that a locomotive would be the only practical power with a railroad, but the truck can be worked for all kinds of haulage, while the standard engine would only be serviceable on rails, and the investment could only be made at a loss unless there was probability of utilizing it a considerable part if not all of the time.

The company is building this section of road surface 16 feet wide and the work is progressing at the rate of from 500 to 600 linear feet a day. The material used is crushed stone, sand and cement, and this is hauled on an industrial railroad four miles long by the truck, which draws a train of about a dozen trailers, each of which is loaded with  $1\frac{1}{2}$  yards of material. The trailers are a dumping type and are loaded and unloaded by gravity. Each day the truck makes 10 round trips, or 80 miles, hauling from 24 to 26 tons of pay load a trip, the speed being from 12 to 15 miles an hour.

The truck "straddles" the rails of the track and has a very good roadway at either side for the wheels, and sufficient traction is obtained to haul the trailers easily, although no load is carried on the machine itself. The truck is a Four Wheel Drive vehicle and there is practically the same traction with each of the four wheels. The contractors state that the same

work could not be done with 50 teams of wagons, and as the cost of operating the truck and trailers is \$17 a day, there is a very great saving made by the use of the outfit in this work alone, to say nothing of future possibilities with it.

The only necessity is to lay additional sections of track for the trailer train as the work of the highway progresses, which can be done so that the material may be delivered close to the workmen. Extension of the track is a much more economical proposition than changing the base from which the materials are hauled, and with the use of the truck the gradual increase of the distance is not an important factor.

### TRUCK CLIMBS PIKES PEAK.

The hill climbing powers of International trucks was well demonstrated recently when a 2000-pound vehicle of that make, carrying four men, completed a trip over the world's highest automobile highway without mishap or single adjustment to the power plant. The truck is one that is in daily use in transportation service at Colorado Springs, and it was from that city that the trip began.

The occupants included H. J. McKenna, general agent for the International Harvester Company of America, Denver; Harry Huffman, International motor truck dealer at Colorado Springs; Raymond B. Stamm, motor truck salesman; a photographer, and Harley McGregor, owner of the truck.

At an altitude of 11,000 feet the truck began to pass through perpetual snow banks. At the 12,000 foot level the road was blocked by falling boulders from the blasting in progress on the unfinished road above. At this point, the end of the upward climb, the machine was within 2108 feet of the summit.

The International truck is a four-cylinder vehicle, equipped with internal gear drive, and it made the climb without even an adjustment to the carburetor.



International 2000-Pound Truck Descending Pike's Peak, Colorado, After Being Driven to the End of the Road Up That Mountain.

## WHITE ROAD CONSTRUCTION EQUIPMENT.

**S**PECIAL equipment designed for use in road construction or maintenance is built by the White company and supplied with White truck chassis of either three or five tons capacity. While intended largely for municipal service, it is equally desirable for contractors for road building or repairing. The complete apparatus will do work for which several machines were required. It may be used for street flushing and sprinkling, applying either light or heavy, hot or cold oils, or hot asphaltic oil under pressure, and with the apparatus removed from the chassis it may be used for general haulage.

The chassis equipment was conceived because of the large demand for the good road type of truck developed for highway construction and which has been found exceptionally economical. On completion of the apparatus it was demonstrated to municipal engineers at the factory and orders were received from a number of cities, counties, road maintaining and public service companies. The accompanying illustrations were made from photographs of the machine sold to St. Louis.

The apparatus has the patented White heating system and a rotary displacement pump that is extremely efficient. The pump is driven by the countershaft from the rear of the case of the transmission gearset and has a lift of 13 feet. Water or oil may be taken into the tank through the large filler at the top or pumped through an intake at the front. When filling the truck need not be lower than the tank from which the supply is drawn. The oil in the tank can be heated to any desired temperature, and while heating it may be kept constantly in circulation by the pump, which shortens the time of heating and insures even consistency of the oils. When the discharge of oil has been stopped at the nozzles the pump carries the oil in the pipes back to the tank and an automatic

drip trough is dropped that prevents leakage of oil into the street. This is a thorough protection against oiling street crossings.

With the White heating system there is no need of a separate plant for increasing the fluidity of oil, as the temperature can be raised one degree a minute with a filled tank and maintained at 360 degrees. The heater is located in a separate section at the rear of the tank and the heat distributed uniformly to the boiler flues that are in the one-third lower section of the tank. There is no possibility of overheating. The 16 distributing nozzles are at the rear of the tank and are operated by a man on a small seat at the right side. The discharge from these will cover a section of roadway six feet six inches wide, but may be moved two feet on either side from the centre. Each nozzle has a fan-like discharge that overlap, and the oil may be distributed at 30 pounds pressure. Three sets of nozzles are provided to obtain varying rates of discharge. The pressure gauge and thermometer are within view and reach of the operator, who can communicate with the driver by a double bell system of signals. After use for oiling the apparatus may be cleaned for water sprinkling or flushing by circulating kerosene with the pressure pump. A small tank of kerosene is carried at the left side of the truck. While using water the pump will deliver 300 gallons of water a minute on a section of street from eight to 12 feet wide as a flusher, and with the nozzles a range of from 20 to 40 feet width is practical. The apparatus with an 800-gallon tank is installed on a 45-horsepower three-ton chassis, or a 1000-gallon tank with the same power plant on a five-ton chassis. The tanks are heavy steel, hot riveted and caulked inside and out. The 1000-gallon tank is 10 feet six inches length and four feet diameter.

The apparatus is so installed that it may be changed for another body with little labor.



Right Side of the White Chassis and Road Building Apparatus, Showing the Pump Intake and Control.



Rear View of the Equipment, Showing the Kerosene-Burning Heater and the Nozzles and Distributors.



## DEALERS' OPPORTUNITIES SELLING TRACTORS.

**A Wonderful Market That Is Just Developing, Where the Men Who Sell Experience and Not Experiments Will Have Practically Unlimited Possibilities.**

By H. L. GADDIS, of International Harvester Company.

**S**O RAPIDLY has the light farm tractor come to be recognized as the solution of farm power problems, and in a great measure the solution of the high cost of farming, that it really stands out as the most interesting proposition for the dealer since the appearance of the grain binder. It is a noteworthy fact one loaded with inspiration to the farseeing dealer, that from Government reports it actually requires more horse power for farming operations than all other industries combined which require power for production. It is well to consider, therefore, for a moment, some of the reasons why the light tractor is coming into its own with the farmer and therefore why the dealer should seize this

internal combustion engine was applied in turning out tractor power in large units.

The welcome given to the light farm tractor by the



L. C. Jaques of Green County, Ia., Harrows 80 Acres in 10 Hours With This Mogul Tractor.



Seeding 60 acres in 10 hours with a tractor at an actual cost of six cents per acre for power.

opportunity for an interesting and profitable addition to his business.

In general, it is not because power farming is an idea new to all farmers but rather for the reason that tractors are being designed to fit all farms. The greatest need for this tractor power came first from the big farm farmers. For them it was just as necessary but much more difficult to seed and harvest their larger acreage of crops with ordinary horse power than for the small farm farmer. Consequently, it was to supply their need that the principle of the

owners of farms of average size can be traced to an economic phase of farm conditions. Farm land is high in price and will continue to increase in value as the population increases. That means farm units will tend to decrease rather than increase in size. With a farmer's acreage limited, he can look forward to using only the same number of acres for producing his crops or livelihood.

By United States Government reports, the average diversified farm contains in the neighborhood of a quarter section of land. Out of this 160 acres there is on the average 60 acres used for pastures, feed lots and truck patches. This leaves only 100 acres for actual production. With 100 acres available,



The Light Farm Tractor Builds Better Roads and Can Build More of Them Than Can Be Built With Horses. E. W. Martin, Ann Arbor, Mich., Owns This Outfit.



John Stark, of Aurora, Ill., Disking His Fields Twice at One Operation With a Titan 10-20 Tractor.

there is a fixed average for the amount they will produce. This takes into consideration the fact that the farmer uses the most approved methods of increasing the yield of the soil by crop rotation, fertilization and seed selection. An acre of ground on the average will yield just so much year after year. Hedged in by the limitations of high-priced land and a uniform average yield from that land yearly, there is really only one way to gain more profits in farming and that is, to reduce the costs.

#### Great Cost of Animal Power.

According to the Extension Bulletin No. 15, issued by the Minnesota Farmers' Library, practically half of the gross cost of farming comes from the work done by horses. Along this line the United States Department of Agriculture gives facts that are important. From Bulletin No. 73, the yearly maintenance cost by actual test, ranging from 1904 to 1907, was \$79.80 per head. Of this amount \$51.39 was for feed, a horse consuming in a year three tons of hay and 4,686 pounds of grain, or the product from five average acres of farm land. Other items included care, harness, repairs, shoeing and depreciation in value. From 1908 to 1912 the yearly maintenance cost covering the same items totaled \$96.21, according to the Extension Bulletin No. 15, and on the basis of the above Government report for 1914, the average cost per head was \$129.23.



Mogul 8-16 Kerosene Tractor Plowing Deep in Hard Adobe Soil on the L. H. Molise Ranch Near San Jose, Calif.

Now from the United States Bulletin No. 73 in the six-year test from 1902 to 1907, the farm horse worked on an average of 3.15 hours per day throughout the year, or a total, counting 313 working days to a year, of 985 hours. With \$129.23 the average cost per horse in 1914, the average cost per hour would be about 12½ cents.

#### Where Horse Food Is Expense.

Now, according to census reports, there are six work horses on the average 160-acre farm. In a year these horses will consume the product of five average acres per head, or a total of 30 acres, and will cost altogether, including feed and other expense, \$775.38. This leaves only seventy acres on the average diversified farm from which the remaining costs must be deducted before profits can be considered.

This is evidence enough that the farmer not only needs something to reduce power costs but he is com-



A Titan Tractor Road Grading Outfit Owned and Operated by the Town of Fairland, Oklahoma.

ing to the point where he recognizes that need and is showing it by the interest which he manifests in the light farm tractor. A serviceable, light farm tractor, with a comparatively low cost of operation, will do more field work in a day at a much less cost in cash and energy expended than can be done with horse labor. A good standard make of light kerosene tractor will plow in a 10-hour day with two bottoms 5.6 acres at a cost of \$3.75 for fuel and oil, while with four horses pulling a two-bottom plow and plowing only four acres a day, it will cost, on the basis figured in Government reports, \$5. In addition to that, when the tractor is not working it requires neither feed nor care, while the horse is a power plant that requires a constant head of steam that takes feed and care 365 days out of the year.

There is no question but that the demand for farm tractors, as marked by the great numbers already sold and by the interest evidenced by all farmers, will grow to even greater possibilities than at the pres-



Modern Farm Power Crowding Hard Upon the Historic at the Fremont, Neb., 1915 Demonstration of Farm Tractors.

ent time. The problem confronting the tractor manufacturers is one of distribution. That the implement dealer is the logical man to handle the tractor business is recognized by practically all tractor manufacturers. He is in a position to know local farm conditions, know the farmers and their needs, better than anyone else. Then, too, the tractor is to be used in connection with other farm machinery which such a dealer handles. He holds a decidedly strategic point in the campaign for tractor sales.

But to get satisfactory results with the tractor, both for himself and the company whose tractor he handles, means much more than simply signing a sales agreement. The tractor is a heavier proposition from a sales standpoint than anything the implement dealer has had occasion to sell. In view of that fact, he must become better posted in the tractor game. He must know tractors—their strong points, their weak ones—as he now knows those of the more common farm machines. In his zeal for business, while the practical utilities of most light tractors now on the market are not well understood, the dealer is very likely to oversell his proposition. This tends to create dissatisfaction in the farmer's mind and serves as a block to further business. With tractor companies forming almost daily, knowledge of what constitutes a good, serviceable tractor for any locality is extremely necessary. Upon what tractor a dealer selects will depend his success in this new field.

#### The Dealer's Sales Problems.

To determine upon standard specifications in a light tractor, with the market offering a host of types to select from, is somewhat of a problem for the dealer. There are all sorts of freak designs, both in truck and motor. Most of these tractors have merits, but are in the main useful only in a particular line of work. In general, a light

farm tractor to be serviceable should embrace in truck design features that have been accepted as standard by manufacturers of steam and gas tractors. No tractor for general farm work, drawbar or belt, should diverge from accepted tractor design, if it is to have wide selling possibilities.

For farm work a tractor should have two drive wheels for good traction and proper weight distribution. All four wheels of the truck should be high enough to give ample clearance under average conditions and add to the leverage on the load to be pulled. The motor should be the simplest possible to deliver the power required because the farmer operator hasn't the technical training necessary for handling a complex piece of machinery. All parts of the motor should be accessible, and the secret of the success in satisfying the users of farm tractor power comes, mainly, from the fact that each purchaser of a power unit has had the construction and method of operation of his tractor explained to him clearly at the start, thus avoiding much costly experience. In addition to simplicity of design, the practical and economical farm tractor of today should be able to deliver its power upon the cheaper grades of fuel. The high price of gasoline places the gasoline tractor in the high-cost class, and throughout the country the farmer is becoming more and more posted upon the fuel situation and is beginning to demand that his power plant should be built to use the cheaper fuels before he will admit of his being a prospective purchaser.

The light tractor promises to become a standard farm commodity, and the dealer who recognizes its value as a business proposition at this early stage and lays intelligent plans to handle it, is on the road to success in tractor selling. He should select a tractor for his trade with an eye to building up a successful business. A farmer is too good a buyer to be imposed upon by freakish machinery and the dealer should realize that it is important to sell experience rather than experiments in tractors, if he would build up a good, stable business.



C. L. Shipman of Hughesville, Penn., Delivers Mogul Kerosene Tractors to His Trade Two Carloads at a Time.

## NATIONAL FARM TRACTOR DEMONSTRATION.

**Eight Great Exhibitions, Without Competition, Through Country from Southwest to Northwest to Educate Farmers to Practical Possibilities of Machines.**

**M**AGNITUDE and greatness is expressed the world over by the phrase "the American way of doing things," and there is no better example of wonderful progress and development than the motor vehicle industry of America. But while the growth of this industry has been spectacular and even marvelous, there is every reason to believe that it will be eclipsed within a comparatively few years by the seemingly instant demand throughout the world for motor farming implements.

American farming machinery is standard and is superlative as contrasted with all similar tools in every country, and there is nothing strange that there should be the adaptation of power to their operation. In America the general purpose has been to accomplish with special tools what is accomplished with labor in Europe where labor has been extremely cheap and farming has been intensive rather than on large scale, but until within a very few years, when attention was directed toward the possibilities of power farm implements by the successes of automobile practice and the utilization of internal combustion engines for widely differing purposes, the practicality of tractors had not been established.

High cost of labor and its scarcity, as well as the rapidly increasing expense of animal maintenance, was the first incentive for American tractor manufacturers to develop machines and exploit them. In Europe, until the beginning of the war, motorized farming tools were regarded as fads rather than utilities. Now both in this country and abroad there is a wonderful demand for tractors, and though there are now nearly 150 different concerns in America building or developing them, they cannot meet the requirements of the domestic market. But this demand must be supplied and America is better prepared to build tractors than any other nation, so that with a great home market and all the markets of the civilized world open to them, the possibilities for American tractor manufacturers has greater promise and more certain possibilities than had the automobile industry.

### The National Tractor Demonstrations.

Manifestation of the interest in tractors for farm uses brought about the organization of a series of what are known as national demonstrations, the first of which will take place at Dallas, Tex., the week of July 21, on the Caruth farm, five miles north of that city, and in which more than 60 different manufacturers will show machines. And following this there will be a series of similar demonstrations which will take place at Hutchinson, Kan., July 24-28; St. Louis, Mo., July 31-Aug. 4; Fremont, Neb., Aug. 7-11; Cedar Rapids,

Ia., Aug. 14-18; Bloomington, Ill., Aug. 21-25; Indianapolis, Ind., Aug. 28-Sept. 1. and Madison, Wis., Sept. 4-8.

The following concerns manufacturing tractors were entered to make the demonstration at Dallas, and there is probability that this was somewhat increased. These companies will be represented at practically all of the other demonstrations:

Advance-Rumely Company.....	Laporte, Ind.
Albaugh-Dover Company.....	Chicago, Ill.
Allen Tractor Company.....	Chicago, Ill.
Allis-Chalmers Manufacturing Company...	Milwaukee, Wis.
Aultman & Taylor Machine Company.....	Mansfield, O.
Avery Company.....	Peoria, Ill.
B. F. Avery & Sons.....	Louisville, Ky.
C. L. Best Gas Traction Company.....	Oakland, Cal.
Buckeye Manufacturing Company.....	Anderson, Ind.
Bull Tractor Company.....	Minneapolis, Minn.
Bullock Tractor Company.....	Chicago, Ill.
J. I. Case Threshing Machine Company....	Racine, Wis.
Chase Motor Truck Company.....	Syracuse, N. Y.
Dauch Manufacturing Company.....	Sandusky, O.
Dayton-Dick Company.....	Quincy, Ill.
Denning Tractor Company.....	Cedar Rapids, Ia.
Dunham Company.....	Berea, O.
Electric Wheel Company.....	Quincy, Ill.
Emerson-Brantingham Implement Company	Rockford, Ill.
Ford Tractor Company.....	Minneapolis, Minn.
Happy Farmer Tractor Company.....	Minneapolis, Minn.
Hart-Parr Company.....	Charles City, Ia.
Holt Manufacturing Company.....	Peoria, Ill.
Huber Manufacturing Company.....	Marion, O.
International Gas Engine Company.....	Cudahy, Wis.
International Harvester Company.....	Chicago, Ill.
Townsend Manufacturing Company.....	Janesville, Wis.
Joliet Oil Tractor Company.....	Joliet, Ill.
Kansas City Hay Press Company.....	Kansas City, Mo.
Kinnard-Harness Company.....	Minneapolis, Minn.
John Lauson Manufacturing Company....	New Holstein, Wis.
Lawter Tractor Company.....	St. Marys, O.
Maytag Company.....	Newton, Ia.
Minneapolis Steel and Machinery Company	Minneapolis, Minn.
Moline Plow Company.....	Moline, Ill.
McIntyre Manufacturing Company.....	Columbus, O.
Nilson Farm Machine Company.....	Waukesha, Wt.
Parrett Tractor Company.....	Chicago, Ill.
Peoria Tractor Company.....	Peoria, Ill.
Pioneer Tractor Company.....	Winona, Minn.
Rock Island Plow Company.....	Rock Island, Ill.
Russell & Co.....	Massillon, O.
Simplex Tractor Company.....	Minneapolis, Minn.
Standard-Detroit Tractor Company.....	Detroit, Mich.
Steel Klug Tractor Company.....	Detroit, Mich.
Tom Thumb Tractor Company.....	Minneapolis, Minn.
Waite Tractor Company.....	Chicago, Ill.
Walls Tractor Company.....	Racine, Wis.
Ward Tractor Company.....	Lincoln, Neb.
Waterloo Gas Engine Company.....	Waterloo, Ia.
Willmar Tractor Manufacturing Company..	Willmar, Minn.

Besides these concerns there were a large number of manufacturers of accessories, supplies and equipment who will be represented at the demonstrations.

In the preparations and conduct of these demonstrations the same stupendous scale of operations that has stamped the tractor industry with unmistakable assurance of success is noted, no cost or energy being spared to make them country wide in scope and absolutely thorough to dissipate any doubt that might exist in the mind of the agriculturist as to the serviceability and adaptability of tractors to his uses. Manufacturers numbering 125, including those manufacturing plows, etc., are spending about \$2,000,000 on the demonstrations this summer, or about a quarter of a

million dollars at each exhibition. More than 500 men have been detailed from the different factories to make the demonstrations and it is conservatively estimated that the total attendance at all the exhibitions will exceed 1,000,000.

#### **Thoroughness of the Exhibitions.**

An idea of the thoroughness of the demonstrations may be gained from the fact that the rules under which the demonstrating is done cover all the various uses for which tractors are practical, including plowing, discing, seeding, packing, manuring, spreading, drilling, harrowing, cold crushing, corn cultivating and rolling. Arrangements are also made to insure fairness to all exhibitors so that large and small manufacturers may exhibit to equal advantage. The fields to be plowed are divided into as many sections as there are machines to be demonstrated, the areas allotted to each tractor being determined by the number of plow bottoms drawn and the speed of the engines as rated by the makers. Dynamometer tests are made on each field on the morning preceding the demonstration, a 14-inch plow being used running at a specified depth. The actual pounds draw bar pull for a 14-inch plow is furnished each competitor to determine the number the tractors shall pull. The kind of fuel used is optional with the exhibitor, except that he must obtain it from the same source as all the competitors to assure a similar gravity test. Time is also set aside for private tests for individuals, giving the manufacturers opportunity to make sales during the demonstrations.

#### **Manufacturers United for Promotion.**

The credit for this progressive enterprise is due to the members of the Tractor and Thresher Manufacturers' Association. The excellent management and executive ability manifested in organizing the National Tractor Farming Demonstrations, the name by which the various exhibitions are known collectively, reflects great credit on the tractor demonstrating committee of the association, which has full charge of the work, except for the local committees that handle the preparations in the various cities where the demonstrations are to be held. This committee in turn also owes much to J. B. Batholomew of the Avery company, who is the acting chairman and is a zealous worker in behalf of tractor progress. The other members of the committee are: W. H. Haggard, Emerson-Brantingham Implement Company, secretary; G. P. Alexander, Aultman & Taylor Machine Company; P. J. Lyons, Bull Tractor Company; E. J. Everson, International Harvester Company; H. B. Dinneen, Deere & Co.; Bradford Brinton, Grand Detour Plow Company; George McFarland, Peoria Tractor Company; H. H. Bates, Joliet Oil Tractor Company.

#### **Practical Man in Charge.**

A. E. Hilderbrand of Bloomington, Ill., considered the best informed demonstration man in the United States, has personal charge of the demonstrations which are conducted under rules formulated by a

committee of the American Society of Agricultural Engineers.

A big feature of the demonstrations is that they are not in the nature of contests; in fact, that impression is carefully avoided, as the principal purpose is to prove the utility and value of the tractor in aiding man in his agricultural pursuits. They are also held as a means of bringing the tractors to the farmers' doors, where they can see them in operation, as with a large number of this class of people "seeing is believing." The earlier tractors, which were as far different from the present day product as earth is from air, were not successes in the hands of inexperienced farmers, and their use did not leave a favorable impression, whereas the latest machines, which represent the best of scientific engineering principles established by 16 years of practical experience, are serviceable, reliable, long lived and economical. Waiting for the farmer to come to the tractor is not only a very slow process of getting him interested, but un-American, so the manufacturers are taking tractors to the farmer and showing them in action, an honest, truthful demonstration of its worth being the last act in good salesmanship. The buyer takes no one's word for anything, he sees the tractors in operation under conditions similar to those which he must meet; finds out how much work they will do and at what cost. Will it do the work of his horses cheaper and more efficiently? is a question to be answered in these demonstrations, and it must be answered.

#### **What the Farmers Must Do.**

The farmer's labors are varied and extensive in their scope. In preparing the seed bed he must plow, harrow, disk, roll and pack it. He next drills in oats, wheat and lists corn. Then comes the harvesting, involving drawing grain binders, corn binders and headers. Next is belt work, including ensilage cutting, corn shelling, feed grinding, hay baling, shredding, wood sawing, running lighting plants and small threshers; ice harvesting is another work and finally he may want his tractor for road haulage, pulling stumps, spreading manure, moving small buildings, raising windmills, hauling water and hay, and perhaps taking crops to markets.

These various works may vary with the location, but good authorities claim that to make the tractor most profitable it should be used at least 50 days in the year. The manufacturers now turn out machines that working even 80 or 100 days a year should last five to six years if handled with any reasonable amount of care. The question of handling the tractor, however, is less important than it was at first, as the engines and mechanism have been greatly simplified as compared with the designs of several years ago, and this is a fact that is being demonstrated in the present exhibitions to good advantage. Doubts are dispelled and the buyer is shown that he is certain to get value received and that he is making a good investment.

Answering the question as to whether or not these



efforts of the tractor manufacturers are falling on a fertile field, it might be said that few markets of as large a scope as that for tractors have ever been as receptive, or contain so many elements of worth upon which to build a thriving, permanent industry. Unlike the automobile, which is essentially a pleasure vehicle, the tractor holds forth to the farmer more promises than any mechanical appliance except possibly the cotton gin and the wheat harvester. Some students of the situation, however, do not even exempt these machines in summing up the new era in farming that will be brought about by the use of the tractor. First of all it has proven a great saver of time.

This in itself means everything to the farmer, for he can increase his production, earn more money and have leisure time in which to enjoy it, whereas with the old methods of farming the life of the agriculturist was largely drudgery year in and out. It also emancipates him from much of the manual labor and lifts his occupation to a higher standing by increasing the extent and scope of his work; in fact, putting him in a managerial or executive position.

#### **Tractors Will Save Crops and Labor.**

On thousands of farms in this country and in foreign countries, portions of the crops go to waste for lack of labor every year. Labor being easily computed in time, it has actually been lack of time, as the man's harvesting task proved more than he had time for, he being limited by the amount of work and the hours that he could use his horse for. Here is where the tractor makes its greatest showing.

Dollar for dollar invested, and cost of maintainance and operation considered, it will far outclass the horse working the same hours, but when the horse must be stopped for a rest and to be fed, the tractor chugs merrily on and can be made to crowd the work of two ordinary days into one. For a long while the impression was prevalent that the tractor was serviceable only in breaking the seed bed, but this idea is being rapidly dissipated by the demonstrations now being held and the tractor will in the near future save the same place in the economic status of the farm that has been held by the horse for centuries. It will increase land values by making the land more productive and the operations incident to the cultivation and harvesting more agreeable and less expensive. Far sighted western bankers see in the tractor a veritable Alladin's lamp for the western farmer. The results of its general adoption on farms are too far reaching to comprehend, but it is safe to predict that it will open hundreds of thousands of acres of land not now in use and will put the farmer on a basis of prosperity never before enjoyed, and last, but not least, will tend to increase social activities among that great class of producers, numbering over 6,000,000 people in this country, who through lack of time have been denied the enjoyment of vacations or even sociable gatherings at night in their own homes or those of neighbors.

The importance of the farmer as the basic economic factor in the United States is little appreciated

by the average person, who has not the slightest idea what the relation of the farmers' work bears to the general prosperity of the nation. The Department of Agriculture in estimating the value of farm products in the United States placed the total at \$10,500,000,000 annually. To the average mind a mere glance at these figures should suffice to tell the whole story, which to conjecture with has unlimited possibilities. It indicates the greatest buying power of any class of people in the world, and there is no question about the stability of their business, as they produce something that is an absolute necessity and will be forever. Couple these figures with the United States census figures and it is found that production must continually increase among the farmers, as present prices for all their products indicate that consumption in this country, or rather the demand, has been gradually increasing beyond the supply.

It is needless to expatiate upon the subject, as these figures show the tractor field in a nut shell, but like many self evident facts, it must be first pointed out to become so. In other words, for the benefit of the timid dealer, it might be suggested that he look around for another market that is composed of 6,000,000 people, that produce \$10,500,000,000 value salable products every year.

#### **The Market for Tractor Dealers.**

Another field opened by this new industry is in the distribution of the tractor. Thousands have already been bought from the manufacturers direct through advertising, but the field is open for the dealer, as the business, to be a large success, will have to be conducted on the same lines that made possible the distribution of millions of automobiles. Great opportunities are afforded the dealers, as there is not only a large number of types and sizes of tractors manufactured, but these manufacturing firms are spending vast sums of money in familiarizing and acquainting the farmer with their product to an extent where he needs little coaxing or urging to become a purchaser. These opportunities do not lie alone in the western states, but are worthy of the investigation of men in a position to handle the business in the eastern and New England states, as smaller machines are rapidly coming into use in the latter sections.

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#### **TRUCK TIRES.**

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F. H. Sawyer, manager of the Metz tire department of the Goodyear Tire and Rubber Company, makes a unique analogy regarding truck tires. He says they are the shoes of the motor truck and demand the same degree of care in their selection that one exercises in the purchase of his own shoes. "The dancing master, policeman, sportsman and working-man all have shoes," says Mr. Sawyer, "but no one type or weight produces satisfaction for all of them, so each selects the type best suited to the service expected. Likewise, in the selection of truck tires, the service expected must govern the choice.

## EUROPE A WONDERFUL FARM TRACTOR MARKET.

**W**HILE the farm tractor industry in America is progressing with a rapidity unknown to any other mechanical line of manufacture, there are indications that in Europe there will be even a greater demand for these labor saving machines, as conditions in practically all European countries are such that imperative need exists for what will meet the dearth of farm laborers and continue, if not increase, the productivity of the soil.

The situation in England may be said to be typical also of Russia, Germany, France, Italy, Austria and the other countries now at war, and the conditions of agricultural industry are such that the farm tractor is apparently the only solution of the shortage of farm labor. The United Kingdom should prove a large and lucrative market for American tractor manufacturers, a fact made very evident at the Royal Agricultural show held recently in Manchester, where every year the manufacturers exhibit farming implements. In the first place the restrictions placed by the government on exhibit of all new agricultural motor machines constructed after April 6 of this year limited the manufacturers and resulted in a relatively small and poor exhibition, while they were also greatly handicapped by the lack of labor in producing machines.

This situation naturally gave prominence to the American tractors in England and while there were several at the show, these attracted widespread interest. There seemed to be no great antipathy toward American implements, which are being imported in large numbers, as every one realizes the great need of these machines to cope with the agricultural situation. The labor shortage for the coming harvest in European countries is so acute it has been given the direct attention of the governments and committees have been appointed to make plans to deal with it.

One of the leading English manufacturers of farm implements, in discussing the situation at the show, said that practically all the farmers and landholders he had interviewed were of the opinion that the small internal combustion engine was bound to replace the horse for much agricultural work and that this change would take place in the near future, some fixing two years as the time the horse would continue its supremacy as the power unit on farms.

### England Ready for Tractors.

Coming into general use in England in present conditions, when the need is imperative, the motor farm tractor will undoubtedly be given tests that will as firmly establish its utility in the minds of agriculturists in a comparatively brief time as would normally require a 10-year period of development, as the British farmer has always been slow to adopt modern methods. Certain conditions exist abroad, however, that make the tractor less attractive for farming than in this country or other countries where the agricul-

tural operations are of large areas and on huge scales. Intensified farming is the rule in Europe, with comparatively small fields, where the tractor is less efficient.

This objection, however, is being largely overcome as one of the committees, mentioned above, not only met with considerable success in aiding manufacturers in increasing their production of farm machines, but devised a plan by which tractors could be utilized to the best advantage by small farmers and also a system by which the poorer class through co-operation could secure the use of tractors. Local organizations are formed, which issue stock for subscription. The farmers pay a small part of the face value of their shares and funds are secured from local banks in the form of overdrafts, the combined members of the organizations guaranteeing the loans. The tractors are let to members or others at a suitable profit to pay the interest on the cost and enough to pay the banks the advanced funds.

### Can't Supply Home Demand.

British publications are on record as admitting that English built agricultural tractors are not being produced in sufficient numbers to supply the home market, and that the factories cannot now supply needed parts for machines they can deliver, nor can they make prompt repairs. This situation not only leaves a big field open for American manufacturers in Great Britain, but also in the other countries where similar conditions exist.

The ideal tractor in the English mind does not seem to be one in which low cost is the main factor, but that which has mechanism strong and simple and so housed that it is protected from rain or dirt; that has an engine that can deliver full power for long periods and so designed that if any devices are used for securing traction for the wheels these can be detached or attached easily and in a short time.

The home market in England, or rather that limited to the British Isles, requires a tractor that operates to the best advantage on small areas, for larger machines, such as are used on the western plains, in Australia or Russia, are really not suitable for working the average farm.

### French Favor Use of Farm Tractors.

As the result of a recent test of the latest types of traction and motor farm implements in France, which was held under the direction of the Academy of Agriculture, the verdict of the directors was in favor of motor driven as compared with horse machines, and the general use of the former was recommended. There was considerable wear on the machines on account of the difficulty of keeping them lubricated in flying dust, but the net results were very satisfactory. Two and a half acres were plowed in light soil with a consumption of 10 gallons of gasoline in four hours.

# TRACTOR PLOWING RATINGS AND PRICES.

Alphabetical List of Farm Tractor Manufacturers Whose Machines Are Described by Specification, with Rated Capacities for Field Work and the Market Values.

## Advance Rumely Thresher Co., Laporte, Ind.

Model	No. Plows	Price
8-16	..	\$790
12-24	..	990
15-30	..	1500
15-30	..	1850
30-60	..	2850

## Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Model	No. Plows	Price
AC-10-18	2	\$750

## American Tractor Co., Des Moines, Ia.

Model	No. Plows	Price
20-35	..	\$1400

## Andrews Tractor Co., 26th and University Aves., Minneapolis, Minn.

Model	No. Plows	Price
..	3	\$640

## Altman & Taylor Mach. Co., Mansfield, O.

Model	No. Plows	Price
30-60	8	....
25-50	6	....
18-36	4	....

## B. F. Avery & Sons, Inc., Louisville, Ky.

Model	No. Plows	Price
..	..	\$850

## Avery Co., Peoria, Ill.

Model	No. Plows	Price
40-80	8-10	\$2625
25-50	6	2190
18-36	5	1775
12-25	4	1195
8-16	3	760
5-10	2	365

## Bates Tractor Co., Lansing, Mich.

Model	No. Plows	Price
A	4	\$1500
B	2	900

## C. L. Best Gas Traction Co., Oakland, Cal.

Model	No. Plows	Price
16 H. P.	3	\$1400
30 H. P.	5	2550
45 H. P.	6	2700
75 H. P.	10	4700
90 H. P.	12	5200

## Boring Tractor Co., Chicago, Ill.

Model	No. Plows	Price
..	..	....

## Brillion Iron Works, Brillion, Wis.

Model	No. Plows	Price
..	..	\$885

## Buckeye Mfg. Co., Anderson, Ind.

Model	No. Plows	Price
Buckeye, Jr.	2	\$785
C. T. 4	3	1500

## Buckeye Traction Ditcher Co., Findlay, O.

Model	No. Plows	Price
1915-16	5	\$3250

## Bull Tractor Co., Minneapolis, Minn.

Model	No. Plows	Price
Big Bull	2	\$645

## Bullock Tractor Co., Chicago, Ill.

Model	No. Plows	Price
C	4	\$1250

## J. I. Case Threshing Mach. Co., Racine, Wis.

Model	No. Plows	Price
10-20	..	\$890
12-25	..	1425
20-40	..	2100
30-60	..	2650

## Chase Motor Truck Co., Syracuse, N. Y.

Model	No. Plows	Price
10-20	3	\$1750
8-16	2	....

## Cleveland Horseless Farm Machinery Co., Cleveland, O.

Model	No. Plows	Price
..	..	\$1175

## C. O. D. Tractor Co., Minneapolis, Minn.

Model	No. Plows	Price
B	3	\$785

## Common Sense Gas Tractor Co., Minneapolis, Minn.

Model	No. Plows	Price
1916	4	\$1395

## Commonwealth Tractor Co., Kansas City, Mo.

Model	No. Plows	Price
..	..	....

## Corn Belt Motors Co., Waterloo, Ia.

Model	No. Plows	Price
..	3	\$1085

## Corn Belt Tractor Co., Minneapolis, Minn.

Model	No. Plows	Price
1	3	\$750

## Danehy Mfg. Co., Sandusky, O.

Model	No. Plows	Price
"E"	4	\$2000

## Dayton-Dick Co., Quincy, Ill.

Model	No. Plows	Price
9-15	2-3	\$595
12-18	3-4	890
25-40	4-5	1550

## Denning Motor Implement Co., Cedar Rapids, Ia.

Model	No. Plows	Price
"E"	3	\$850

## Detroit Engine Works, Detroit, Mich.

Model	No. Plows	Price
6	..	\$600
8	..	725
12	..	800

## Diamond Iron Works, Minneapolis, Minn.

Model	No. Plows	Price
20-40	..	\$1800

## C. I. Dill Tractor Mfg. Co., Harrisburg, Ark.

Model	No. Plows	Price
..	..	\$2280

## Eagle Mfg. Co., Appleton, Wis.

Model	No. Plows	Price
8-16	..	\$875
12-22	..	1000
16-30	..	1175

## Electric Wheel Co., Quincy, Ill.

Model	No. Plows	Price
Light	3	\$975

## G. W. Elliott & Co., De Smet, S. D.

Model	No. Plows	Price
No. 2	4	\$1500

## Emerson-Brantingham Implement Co., Rockford, Ill.

Model	No. Plows	Price
L	6	....
D	9	....
F	16	....
E	24	....

## Fairmount Gas Engine & Railway Motor Car Co., Fairmont, Minn.

Model	No. Plows	Price
..	..	....

## Famous Mfg. Co., Chicago, Ill.

Model	No. Plows	Price
10-20	..	\$575

## Farm Engineering Co., Sand Springs, Okla.

Model	No. Plows	Price
20-40	..	\$1500

## Farm Horse Traction Works, Hartford, S. D.

Model	No. Plows	Price
15-30	..	\$995

## A. B. Farquhar Co., Inc., York, Penn.

Model	No. Plows	Price
..	..	....

## Ford Tractor Co., Minneapolis, Minn.

Model	No. Plows	Price
B	2	\$465

## Four Drive Tractor Co., Big Rapids, Mich.

Model	No. Plows	Price
..	..	\$1000

## Four Wheel Drive Tractor Co., Clintonville, Wis.

Model	No. Plows	Price
40-60	..	\$1600

## Gray Tractor Mfg. Co., Minneapolis, Minn.

Model	No. Plows	Price
A	6	\$2150
B	4	1650

## Hackney Mfg. Co., St. Paul, Minn.

Model	No. Plows	Price
3	3	\$1000
4	3	1450

## Happy Farmer Tractor Co., Minneapolis, Minn.

Model	No. Plows	Price
8-16	..	\$550

## A. T. Harrow Tractor Co., Detroit, Mich.

Model	No. Plows	Price
C	4	\$1600

## Hart-Parr Co., Charles City, Ia.

Model	No. Plows	Price
Little Devil	3	....
Crop Maker	4	....
Oil King	6	....
Steel King	6	....
Old Reliable	8	....

## Hoke Mfg. Co., South Bend, Ind.

Model	No. Plows	Price
..	..	....

## Holt Mfg. Co., Peoria, Ill.

Model	No. Plows	Price
45	..	....
75	..	....

## Huber Mfg. Co., Marion, O.

Model	No. Plows	Price
20-40	..	\$1800

## Hume Mfg. Co., Hume, Ill.

Model	No. Plows	Price
Hume, Jr.	3	\$885
Hume 20-30	4	1350

## Imperial Machinery Co., Minneapolis, Minn.

Model	No. Plows	Price
..	..	\$3000

## Independent Harvester Co., Plano, Ill.

Model	No. Plows	Price
12-20	..	\$1000

## International Gas Engine Co., Cudahy, Wis.

Model	No. Plows	Price
10-25	..	\$700

## International Harvester Co., Chicago, Ill.

Model	No. Plows	Price
Mogul 8	..	\$725
Mogul 12	..	....
Titan 10-26	..	900
Titan 15-30	..	....
Titan 30-60	..	....

## Interstate Engine and Tractor Co., Waterloo, Ia.

Model	No. Plows	Price
10-20	..	\$675

## Joliet Oil Tractor Co., Joliet, Ill.

Model	No. Plows	Price
1916	3-4	\$895

## Kansas City Hay Press Co., Kansas City, Mo.

Model	No. Plows	Price
A	3	\$1000

## Kinkad Tractor Co., Minneapolis, Minn.

Model	No. Plows	Price
14-28	..	\$850

## Killien-Strait Mfg. Co., Appleton, Wis.

Model	No. Plows	Price
2	6	....
3	3	....

## Kinnard-Haines Co., Minneapolis, Minn.

Model	No. Plows	Price
15-25	..	\$1250
20-35	..	1595
30-50	..	....

## John Lanson Mfg. Co., New Holstein, Wis.

Model	No. Plows	Price
15-25	3	\$1250
20-35	4-5	1800

## Lawter Tractor Co., St. Mary's, O.

Model	No. Plows	Price
18-20	..	....

## H. W. Leavitt, Paris, Mo.

Model	No. Plows	Price
20-32	..	\$950

## Lion Tractor Co., Minneapolis, Minn.

Model	No. Plows	Price
1	3	\$565

## Melutye Mfg. Co., Columbus, O.

Model	No. Plows	Price
10-25	..	\$750

## Mayer Bros. Co., Mankato, Minn.

Model	No. Plows	Price
A	6	\$2000
B	4	1250

## Maytag Co., Keokuk, Ia.

Model	No. Plows	Price
12-30	..	\$975

## Minneapolis Steel and Machinery Co., Minneapolis, Minn.

Model	No. Plows	Price
15	..	\$1000
25	..	2000
40	..	....
60	..	....

Minneapolis Threshing Machine Co., West Minneapolis, Minn.			Phoenix Mfg. Co., Eau Claire, Wis.			Sullivan Tractor Co., Oakland, Cal.		
Model	No. Plows	Price	Model	No. Plows	Price	Model	No. Plows	Price
..	..	\$1000	Model 35-50	..	\$4000	Model 10-20	..	\$1375
Morton Truck and Tractor Co., Harris- burg, Penn.			Pioneer Tractor Mfg. Co., Front and Gar- mona Sts., Winona, Minn.			Tom Thamb Tractor Co., Minneapolis, Minn.		
Model	No. Plows	Price	Model	No. Plows	Price	Model	No. Plows	Price
30-80	..	\$5400	Pioneer 30	10	\$2850	"B"	3	\$1000
Moline Plow Co., Moline, Ill.			Pioneer Junior	6	1750	Townsend Mfg. Co., Janesville, Wis.	..	..
Model	No. Plows	Price	Pioneer Pony	4	765	Model	No. Plows	Price
..	2	\$790	Plantation Equipment Co., Valley Park, Mo.			X	4	\$1000
National Pulley Mfg. Co., Chicago, Ill.			Model	No. Plows	Price	Union Tool Co., Oakland, Cal.		
Model	No. Plows	Price	A	3	\$1000	Model	No. Plows	Price
A	2	\$785	Rock Island Plow Co., Rock Island, Ill.			6-20	..	\$1050
B	3	900	Model	No. Plows	Price	Universal Tractor Co., Inc., Brooklyn, N. Y.		
New Age Tractor Co., Minneapolis, Minn.			"C"	4	\$995	Model	No. Plows	Price
Model	No. Plows	Price	Leo Rumely Tractor Co., Laporte, Ind.			..	..	\$300
10-18	..	\$750	Model	No. Plows	Price	Walte Tractor Co., Chicago, Ill.		
Nichols & Shepard Co., Battle Creek, Mich.			8-18	..	\$850	Model	No. Plows	Price
Model	No. Plows	Price	Russell & Co., Mansfield, O.			A	..	\$800
25-50	..	..	Model	No. Plows	Price	Wallis Tractor Co., Racine, Wis.		
Nilson Farm Mach. Co., Minneapolis, Minn.			12-24	..	..	Model	No. Plows	Price
Model	No. Plows	Price	St. Paul Mch. Mfg. Co., St. Paul, Minn.			"Cub"	4	\$1800
..	..	\$1485	Model	No. Plows	Price	Ward Tractor Co., Lincoln, Neb.		
Ohio Tractor Mfg. Co., Marion, O.			20-40	..	\$2000	Model	No. Plows	Price
Model	No. Plows	Price	Samson Iron Works, Stockton, Cal.			15-25	..	\$1500
H	..	\$2800	Model	No. Plows	Price	Waterloo Gasoline Eng. Co., Waterloo, Ia.		
Ohio Mfg. Co., Upper Sandusky, O.			S (10-25)	4	\$1250	Model	No. Plows	Price
Model	No. Plows	Price	R (6-12)	2	725	R	3	\$750
6-12	..	\$650	Simplex Tractor Co., 1615 Central Ave., Minneapolis, Minn.			Weber Engine Co., Kansas City, Mo.		
Olin Gas Engine Works, Buffalo, N. Y.			Model	No. Plows	Price	Model	No. Plows	Price
Model	No. Plows	Price	15-30	4	\$950	20-35	..	\$1750
13-25	..	\$1200	Standard-Detroit Tractor Co., Detroit, Mich.			Willmar Tractor Co., Willmar, Minn.		
Parker Motor Plow Co., Richmond, Va.			Model	No. Plows	Price	Model	No. Plows	Price
Model	No. Plows	Price	C	3	\$1065	Little Oak	..	\$1400
3-10	..	\$375	Strite Tractor Co., Minneapolis, Minn.			Wolverine Car and Tractor Co., Detroit, Mich.		
Parrett Mfg. Co., Chicago, Ill.			Model	No. Plows	Price	Model	No. Plows	Price
Model	No. Plows	Price	12-25	..	..	1917	4	\$1200
E	3	\$1075	Sweeney Tractor Co., Kansas City, Mo.			Yuba Construction Co., Marysville, Cal.		
Peoria Tractor Co., Peoria, Ill.			Model	No. Plows	Price	Model	No. Plows	Price
Model	No. Plows	Price	D	3-4	\$985	12	..	\$2250
..	..	\$685				18	..	3000

**"BOSCH NEWS" FOR JUNE.**

The June Issue of the Bosch News is a particularly interesting number. Besides a resume of race news it contains a valuable article on "The Futility of Cheap Electric Systems" and "Special Bosch Magneto Attachments" is another subject under which head there is much valuable information for the motor vehicle owner.

**RENEWS KOEHLER CONTRACT.**

The Economy Motor Truck Company, 202 Franklin street, New York City, has renewed its contract with the H. J. Koehler S. G. Company to handle Koehler one-ton trucks and has contracted for 200 model "K" machines for the metropolitan market.

**NEW EDISON OFFICE.**

C. A. Luckey has been appointed resident manager of the new sales office of the Edison Storage Battery Supply Company at New Orleans. He has been attached to the sales office of the Edison Storage Battery Company at Chicago for the past four years. Prior to his connection with the Edison company he was with the Railway Utility Company of Chicago, the Safety Car Heating and Lighting Company and the Western Electric Company.

**FINAL MOTOKART DIVIDEND.**

The second and final dividend of two per cent. on the claims against the Motokart Company, a bankrupt, has been declared by Maggrane Cox, referee in bankruptcy of the southern district of New York.

**"BURD RING WISDOM."**

The subject of "Heavy Gasoline and Oil Fuels," and articles on "Piston Ring Installation" and "Kerosene Not a Carbon Remedy," make up most of the interesting contents of the June number of "Burd Ring Wisdom," published by the Burd High Compression Ring Company, Rockford, Ill.

**NEW PACIFIC COAST MANAGER.**

Tom Jones, who has been with the Goodyear Tire and Rubber Company as a southern representative the past three years, has been appointed sales manager for the Service Motor Truck Company on the Pacific Coast.

**TO ENTER AUTO FIELD.**

The Emerson-Brantingham Company, Rockford, Ill., one of the largest carriage manufacturers in America, will enter the automobile field as builders of automobile bodies and fenders. Work on the new department will commence Aug. 1. This concern, which has been manufacturing farm implements for 62 years and builds the Big Four and Emerson farm tractors, is famed for its wagon body designs. The work of its new department is expected to have high quality.

**WILL BUILD LINE OF TRUCKS.**

Albert K. Stebbins, August C. Moeller and Christine Rodermund, all of Milwaukee, Wis., are the incorporators of a concern which has purchased the old plant of the Wisconsin Engine Company at Corliss, Wis., where the manufacture of trucks and pleasure cars will soon be

commenced. The new company is capitalized for \$100,000 and is largely owned by eastern capitalists. Harry Mohr of Chicago will manage the plant.

**GARY 3½-TON TRUCK.**

The Gary Motor Truck Company, Gary, Ind., which is now manufacturing ¾-ton, one-ton, 1½-ton and two-ton trucks, will soon build a 3½-ton worm drive machine. The engineering department of the company is now working on the design which will be known as model K. It will be equipped with a Buda motor and Sheldon axles.

**ALVIN IN NEW TRUCK CONCERN.**

Forrest J. Alvin, well known as former president of the New Era Engineering Company of Joliet, Ill., manufacturers of New Era cars, has organized a company to build trucks in which he is associated with a number of prominent automobile men. No definite announcement has been made with regard to the vehicles the company will manufacture.

**WANTS TRACTOR FACTS.**

A business man of Costa Rica has written the consular agent there asking for catalogues and descriptive matter of caterpillar tractors and ore trailers with wide tires. Catalogues may be in English and should be accompanied by quotations and terms of delivery, according to information in commerce reports.

The Kosmath Company, of which Edward T. Birdsall and Guy L. Sintz are the moving spirits, has moved from Detroit to Pittsburg, Penn., where its address is 901 Pennsylvania avenue, N. S.

# DIRECTORY OF AMERICAN GASOLINE FARM AND ROAD TRACTOR MANUFACTURERS.

The Names and Addresses of 136 Different Concerns Commercially Producing Machines for Agricultural Purposes, Alphabetically Listed, with the Trade Names of the Type or Types Thus Far Built by 106 Companies for the 1916 Market.

The Trade Names of the Machines Indicated in Bold Face Type Appear in the Mechanical Specifications Given Elsewhere in This Issue, and the Specifications May Be Identified by These Names, and Not by the Names of the Manufacturers. The Known Capacities of These Tractors for Field and Stationary Work Are Listed Under Another Tabulation, Where the Identification Is by Name of the Builder.

Trade Name of Tractor	Manufacturer	Place of Manufacture
<b>Rumely "All-Purpose"</b>	Advance Rumely Co.	Laporte, Ind.
<b>Rumely "Oil-Pull"</b>	Advance Rumely Co.	Laporte, Ind.
<b>Albaugh-Dover</b>	Albaugh-Dover Co.	Chicago, Ill.
<b>Allis-Chalmers</b>	Allis-Chalmers Mfg. Co.	Milwaukee, Wis.
<b>American Oil</b>	American Gas Engine Co.	Kansas City, Mo.
<b>American</b>	American Mfg. Corp.	Indianapolis, Ind.
<b>Andrews</b>	Andrews Tractor Co.	Des Moines, Ia.
<b>Aultman &amp; Taylor</b>	Aultman & Taylor Machine Co.	Minneapolis, Minn.
<b>Louisville Motor Plow</b>	B. F. Avery & Sons, Inc.	Mansfield, O.
<b>Avery</b>	Avery Co.	Louisville, Ky.
<b>Capital</b>	Bates Tractor Co.	Peoria, Ill.
<b>Tracklayer</b>	C. L. Best Gas Traction Co.	Lansing, Mich.
<b>Horsing</b>	Birdsall Engine Co.	Oakland, Cal.
<b>Brillion</b>	Brillion Tractor Co.	Auburn, N. Y.
<b>Huckeye</b>	Buckeye Mfg. Co.	Chicago, Ill.
<b>B. T. D.</b>	Buckeye Traction Ditcher Co.	Brillion, Wis.
<b>Hig Ball</b>	Bull Tractor Co.	Anderson, Ind.
<b>Creeping Grip</b>	Bullock Tractor Co.	Findlay, O.
<b>Case</b>	J. I. Case Threshing Machine Co.	Minneapolis, Minn.
<b>Chase</b>	Chase Motor Truck Co.	Chicago, Ill.
<b>Chief</b>	Chief Tractor Mfg. Co.	Racine, Wis.
<b>Haby Johnson</b>	Cleveland Horseless Farm Machinery Co.	Syracuse, N. Y.
<b>Common Sense</b>	Common Sense Gas Tractor Co.	Detroit, Mich.
<b>Nevernup</b>	Commonwealth Tractor Co.	Cleveland, O.
<b>Farmobile</b>	Corn Belt Motors Co.	Minneapolis, Minn.
<b>Corn Belt</b>	Corn Belt Tractor Co.	Kansas City, Mo.
<b>C. O. D.</b>	C. O. D. Tractor Co.	Waterloo, Ia.
<b>Sandusky</b>	Dauch Mfg. Co.	Minneapolis, Minn.
<b>Leader</b>	Dayton-Dick Co.	Sandusky, O.
<b>Denning</b>	Denning Tractor Co.	Quincy, Ill.
<b>Wadsworth</b>	Detroit Engine Works	Cedar Rapids, Ia.
<b>Diamond</b>	Detroit Tractor Co.	Detroit, Mich.
<b>Dill</b>	Diamond Iron Works	Lafayette, Ind.
<b>Eagle</b>	G. I. Dill Tractor Mfg. Co.	Minneapolis, Minn.
<b>All Work</b>	C. H. A. Dissenger & Bros. Co.	Wrightsville, Penn.
<b>Dakota</b>	Eagle Mfg. Co.	Appleton, Wis.
<b>Emerson L.</b>	Eau Claire Mfg. Co.	Eau Claire, Wis.
<b>Big Four</b>	Electric Wheel Co.	Quincy, Ill.
<b>Fairbank</b>	G. W. Elliott & Co.	De Smet, S. D.
<b>Fairmont</b>	Emerson-Brantingham Implement Co.	Rockford, Ill.
<b>Champion</b>	Emerson-Brantingham Implement Co.	Chicago, Ill.
<b>Little Chief</b>	Fairbanks, Morse & Co.	Fairmount, Minn.
<b>Farm Horse</b>	Fairmount Gas Engine and Railway Motor Car Co.	Chicago, Ill.
<b>Farm Horse</b>	Famous Mfg. Co.	Sand Springs, Okla.
<b>Farm Horse</b>	Farm Engineering Co.	Hartford, S. D.
<b>Farm Horse</b>	Farm Horse Traction Works	Watertown, S. D.
<b>Farm Horse</b>	Farmers Oil Tractor Co.	York, Penn.
<b>Farm Horse</b>	A. B. Farquhar Co., Inc.	Minneapolis, Minn.
<b>Ford</b>	Ford Tractor Co.	Big Rapids, Mich.
<b>Four Drive</b>	Four Drive Tractor Co.	Clintonville, Wis.
<b>Stewart</b>	Four Wheel Drive Tractor Co.	
<b>Trade Name of Tractor</b>	<b>Manufacturer</b>	<b>Place of Manufacture</b>
<b>Plow Boy</b>	Interstate Engine and Tractor Co.	Waterloo, Ia.
<b>Bate's Steel Male</b>	Joliet Oil Tractor Co.	Joliet, Ill.
<b>K. C. Prairie Dog</b>	Kansas City Hay Press Co.	Kansas City, Mo.
<b>K-T</b>	Kinthead Tractor Co.	Minneapolis, Minn.
<b>Strait</b>	Killen-Strait Mfg. Co.	Appleton, Wis.
<b>Kinnard</b>	Kinnard-Haines Co.	Minneapolis, Minn.
<b>Flour City</b>	Kinnard-Haines Co.	Minneapolis, Minn.
<b>Lauson</b>	La Crosse Plow Co.	La Crosse, Wis.
<b>Lawler</b>	John Lauson Mfg. Co.	New Holstein, Wis.
<b>Master Key</b>	Lawyer Tractor Co.	St. Marys, O.
<b>Lion</b>	H. W. Leavitt	Paris, Mo.
<b>Lombard</b>	Lion Tractor Co.	Minneapolis, Minn.
<b>Farmer Boy</b>	Lombard Traction Engine Co.	Waterville, Me.
<b>Little Giant</b>	McIntyre Mfg. Co.	Columbus, O.
<b>Maytag</b>	McKinney Traction Cultivator Co.	St. Louis, Mo.
<b>Twin City</b>	Maytag Co.	Mankato, Minn.
<b>Minneapolis</b>	Minneapolis Steel and Machinery Co.	Newton, Ia.
<b>Moline Universal</b>	Minneapolis Threshing Machine Co.	Keokuk, Ia.
<b>Morton</b>	Moline Plow Co.	Minneapolis, Minn.
<b>Paramount</b>	Morton Truck and Tractor Co.	Moline, Ill.
<b>New Age</b>	Motor Driven Implement Co.	Harrisburg, Penn.
<b>Nichols-Shepard</b>	National Pulley and Manufacturing Co.	Gallon, O.
<b>Nelson</b>	New Age Tractor Co.	Chicago, Ill.
<b>Ohio</b>	Nichols & Shepard Co.	Minneapolis, Minn.
<b>Ohio</b>	Nelson Farm Machine Co.	Battle Creek, Mich.
<b>Ohio</b>	Ohio Manufacturing Co.	Waukesha, Wis.
<b>Ohio</b>	Ohio Tractor Manufacturing Co.	Upper Sandusky, O.
<b>Ohio</b>	Olin Gas Engine Works	Marion, O.
<b>Ohio</b>	Olmsted Gas Traction Co.	Buffalo, N. Y.
<b>Parker Motor Plow</b>	Orchard Machinery Manufacturing Co.	Great Falls, Mont.
<b>Parrett</b>	Parker Motor Plow Co.	South Bend, Ind.
<b>Parrett</b>	Parrett Tractor Co.	Gasport, Ind.
<b>Peoria</b>	Pacific Metal Products Co.	Richmond, Va.
<b>Phoenix</b>	Peoria Tractor Co., Inc.	Chicago, Ill.
<b>Phoenix</b>	Phoenix Manufacturing Co.	Torrence, Cal.
<b>Straddle Row</b>	Phoenix Tractor Manufacturing Co.	Peoria, Ill.
<b>Reed Foundry and Machine Co.</b>	Plantation Equipment Co.	Eau Claire, Wis.
<b>Rock Island Plow Co.</b>	Reed Foundry and Machine Co.	Winona, Minn.
<b>Rock Island Plow Co.</b>	Rock Island Plow Co.	Valley Park, Mo.
<b>Rock Island Plow Co.</b>	Rock Island Plow Co.	Kalamazoo, Mich.
<b>Rock Island Plow Co.</b>	Rock Island Plow Co.	Rock Island, Ill.
<b>Rock Island Plow Co.</b>	Rock Island Plow Co.	Laporte, Ind.
<b>Rock Island Plow Co.</b>	Rock Island Plow Co.	Massillon, O.
<b>Rock Island Plow Co.</b>	Rock Island Plow Co.	Portsmouth, O.
<b>Rock Island Plow Co.</b>	Rock Island Plow Co.	Rochester, N. Y.
<b>Rock Island Plow Co.</b>	Rock Island Plow Co.	St. Paul, Minn.
<b>Rock Island Plow Co.</b>	Rock Island Plow Co.	Stockton, Cal.
<b>Rock Island Plow Co.</b>	Rock Island Plow Co.	Minneapolis, Minn.
<b>Rock Island Plow Co.</b>	Rock Island Plow Co.	Detroit, Mich.
<b>Rock Island Plow Co.</b>	Rock Island Plow Co.	Detroit, Mich.



Gray	Grammont Traction Plow Co.	Springfield, O.	Strite	Strite Tractor Co.	Minneapolis, Minn.
	Gray Tractor Mfg. Co.	Minneapolis, Minn.	Sweeney's Tractor Co.	Sweeney's Tractor Co.	Kansas City, Mo.
	Green Bay Machine Co.	Green Bay, Wis.	Sullivan	Sullivan Tractor Co.	Oakland, Cal.
Hackney Auto-Plow	Hackney Mfg. Co.	St. Paul, Minn.	Tom Thumb	Tom Thumb Tractor Co.	Minneapolis, Minn.
Happy Farmer	Happy Farmer Tractor Co.	Minneapolis, Minn.	Townsend	Townsend Mfg. Co.	Janesville, Wis.
Michigan	A. T. Harrow Tractor Co.	Detroit, Mich.	Temple Mfg. Co.	Temple Mfg. Co.	Cicero, Ill.
Little Devil	Hart-Parr Co.	Charles City, Ia.	Union Tool Co.	Union Tool Co.	Oakland, Cal.
Crop Maker	Hart-Parr Co.	Charles City, Ia.	Universal Tractor Co., Inc.	Universal Tractor Co., Inc.	Brooklyn, N. Y.
Oil King	Hart-Parr Co.	Charles City, Ia.	Universal Tractor Co.	Universal Tractor Co.	Columbus, O.
Steel King	Hart-Parr Co.	Charles City, Ia.	Utility Steel Tractor Co.	Utility Steel Tractor Co.	Antigo, Wis.
Old Reliable	Hart-Parr Co.	Charles City, Ia.	Walte	Walte Tractor Sales Co.	Chicago, Ill.
Hoke	Hoke Mfg. Co.	South Bend, Ind.	Wallis Cub	Wallis Tractor Co.	Racine, Wis.
Caterpillar	Holt Mfg. Co.	Peoria, Ill.	Ward	Ward Tractor Co.	Lincoln, Neb.
Huber	Homer Motors Co.	Los Angeles, Cal.	Waterloo Boy	Waterloo Gas Engine Co.	Waterloo, Ia.
Huber	Huber Mfg. Co.	Marion, O.	Weber	Weber Engine Co.	Kansas City, Mo.
Hume	Hume Mfg. Co.	Hume, Ill.	Westinghouse Co.	Westinghouse Co.	Schenectady, N. Y.
Imperial	Imperial Machinery Co.	Minneapolis, Minn.	William Tractor Mfg. Co.	William Tractor Mfg. Co.	Willmar, Minn.
Independent	Independent Harvester Co.	Piano, Ill.	Wolverine Car and Tractor Co.	Wolverine Car and Tractor Co.	Detroit, Mich.
Ingeco	International Gas Engine Co.	Cudahy, Wis.	Yuba Construction Co.	Yuba Construction Co.	Marysville, Cal.
Mogul	International Harvester Co.	Chicago, Ill.			
Titan	International Harvester Co.	Chicago, Ill.			

## AUTOCAR DIVIDEND.

A five per cent. cash dividend was declared to the stockholders of the Autocar company that was payable June 30. To take care of the company's rapidly increasing business the machinery equipment of the Ardmore, Penn., factory has been increased through the expenditure of \$300,000, which has been added to the capitalization of the company, making it a total of \$1,800,000.

## "GRAPHITE" FOR JULY.

The July number of the monthly publication of the Joseph Dixon Crucible Company contains many interesting facts of the subject of lubrication, which should interest the owners of automobiles or people who use any type of machinery. One article is devoted to enumerating the many different uses for Dixon's Graphite.

## GOODYEAR GENERAL CATALOGUE.

The general catalogue just issued by the Goodyear Tire and Rubber Company, Akron, O., is one of the most complete publications of its kind. It not only catalogues all the products manufactured by the Goodyear company, but gives a brief outline of sales arguments for the various products listed. It also contains a condensed description of the Goodyear company, its policies and service. Dealers will be supplied with the booklet upon writing to the factory at Akron, O.

## "REO TRUCK NEWS."

The first issue of the "Reo Truck News," a publication which hereafter will be issued monthly by the Reo Motor Truck Company, Lansing, Mich., is excellently written and printed, and in the leader, which is entitled "Performances That Built a Factory," the story is told of how the demand for Reo trucks necessitated an expansion of production facilities by the erection of a five-acre exclusive truck factory costing \$250,000.

## BIG FIRE APPARATUS ORDER.

The George C. Hale Company, Kansas City, Mo., has received one of the largest orders for motor driven fire apparatus ever placed in the United States. This calls for 20 type two combination chemical and hose wagons to be used by the Kansas City fire department. This city has used three Hale apparatuses since 1913 and the large reorder is made because of the proven serviceability of the machines.

## NEW GOODYEAR TRUCK TIRE.

What promises to be a very popular truck tire has just been produced by the Goodyear Tire and Rubber Company, Akron, O., under the trade name of the Goodyear Hand-Attached cushion tire. It is designed for use on motor trucks and fire apparatus and is a decided improvement upon the cushion demountable type. Its great feature lies in the fact that it can be applied to the rim by hand without the use of machinery. It has a channel base identical in construction with that of the Goodyear S. V. tire, is non-skid and is the same as the cushion demountable, except that the pockets in

the side, to accommodate the displaced rubber, are oval instead of rectangular in shape.

## EXPANDING PURITAN PLANT.

The Puritan Machine Company, Detroit, Mich., is installing machinery and equipment in the new two-story brick addition which is directly opposite the main plant in Lafayette boulevard. This company, which is the only one in the world supplying parts for all trucks and cars, has purchased more than 100 complete auto companies. More than 15,000 additional feet of floor space will be available in the new plant, which will have a machine shop on the main floor and a store room on the second floor.

## FLINT IS SALES MANAGER.

Herbert J. Flint, formerly sales manager of the Smith Form-a-Truck Company, has become general sales manager of the J. C. Wilson Company, Detroit, Mich., and will have full charge of the distribution of Wilson trucks. Mr. Flint is well known in the automobile trade, having been connected with Thomas J. Hay, distributor of Hupmobile and Chandler cars in Chicago, and at one time distributor of Hupmobile cars in Michigan.

## CUTLER-HAMMER TRADE BOOK.

A new edition of the Automobile Lighting Switch Booklet has been issued by the specialties department of the Cutler-Hammer Manufacturing Company of Milwaukee, Wis. Several assemblies of C-H switches installed on various makes of cars are shown on the first page and a phantom view of the switch on another page shows clearly the three-piece construction and the method of operation. Wiring diagrams for single lamps and various lighting combinations are also illustrated. One interesting fact is the statement that there are now more than 1,000,000 C-H switches in use on automobiles.

## NEW TIRE FACTORY.

The Lee Tire and Rubber Company of Conshohocken, Penn., has placed contract for another building at its plant to provide additional manufacturing space. The new structure will be 80 by 120 feet and two stories, with provisions for increasing the height if necessary.

## CONTRACT FOR FACTORY BUILDING

A factory building which will have capacity and facilities for the employment of 1000 workers is to be erected at Grantley Station, near York, Penn., by the Pullman Motor Car Company, which will be used for production of 1000 pound delivery wagons and pleasure cars.

Contract for a factory building of steel, brick and concrete, 80 by 200 feet, has been made by the Continental Truck Manfg. Co., Superior, Wis.

The Bower Roller Bearing Company at its directors' meeting, July 11, declared a 15 per cent. cash dividend as the regular quarterly dividend.



Make.....	"Brilliant"	Buckeye	Buckeye, Jr.	B. T. D.	Big Bull	Creeping Grip Case	"10-20"	"12-25"	"20-40"	"30-60"	"8-10"	"10-20"
Model.....	.....	.....	.....	1915-16	No. 3	C	\$890	\$1425	\$2100	\$2650	8	\$1750
Price.....	\$885	\$785	\$1500	\$3250	\$645	12	10	12	20	30	10	10
Drawbar HP.....	13	16	32	40	20	20	20	25	40	60	16	20
Belt HP.....	26	32	72	126	104	76	76	90	114	126	108	114
Wheelbase.....	110 in.	88 in.	130 in.	180 in.	173 in.	108 in.	150 in.	148 in.	177 in.	223 in.	168 in.	150 in.
Length Overall.....	150 in.	76 in.	76 in.	130 in.	75 in.	81 in.	67 in.	73 in.	100 in.	105 in.	102 in.	78 in.
Width Overall.....	80 in.	10 ft.	10 ft.	10 ft.	12 ft.	23 ft.	23 ft.	36 ft.	41 ft.	42 in.	36 in.	9 ft.
Turning Circle.....	10 ft.	.....	.....	40 in.	24 in.	30 in.	30 in.	38 in.	30 in.	72 in.	36 in.	36 in.
Dia. F. Wheels.....	30 in.	.....	.....	14 in.	60 in.	52 in.	52 in.	56 in.	66 in.	72 in.	48 in.	36 in.
Dia. R. Wheels.....	36-42 in.	.....	.....	14 in.	12 in.	17 in.	17 in.	22 in.	32 in.	32 in.	14 in.	18 in.
Dia. Belt Pulley.....	12 in.	6 in.	12 in.	10 in.	6 in.	8 in.	6 in.	7 in.	8 in.	12 in.	8 in.	8 in.
Face, Belt Pulley.....	4-cy. ver.	4-ver.	4-ver.	4-cy. ver.	4-cy. ver.	4-cy. hor.	4-cy. ver.	4-cy. hor.	4-cy. hor.	4-cy. hor.	4-cy. ver.	4-cy. ver.
Engine, Type.....	4-cy.	4	4	4-cy.	2-single	2-single	2-single	2-single	2-single	2-single	4-block	4-block
Cyl. No.-Cast.....	2	3	3	6 1/2 x 8 in.	5 1/2 x 7 in.	5 1/2 x 6 in.	4 1/2 x 6 in.	7 x 7 in.	8 x 9 in.	10 x 12 in.	3 1/2 x 5 1/2 in.	4 1/2 x 6 1/2 in.
Bore, Stroke.....	6 1/2 x 8 in.	4 1/2 x 6 in.	4 1/2 x 6 in.	5	2	3	3	2	2	3	3	3
No. Main Bear.....	3	3	3	500	650-720	750	800	600	475	365	120 in.	800
Speed, RPM.....	500	900	850	1-3 1/2	2-3	2 1/2	2	1 1/2	2-3	2	1 1/2	1-2 1/2
Road Speeds.....	2 1/2-4	1 1/2-2 1/2	1 1/2-2 1/2	Pressure	Spl.-pres.	Spl.-pres.	Spl.-pres.	Spl.-pres.	Spl.-pres.	Spl.-pres.	Pressure	Pressure
Lubrication.....	Pressure	Splash	Splash	Cent.-pump	Cent.-pump	Gear pump	Cent.-pump	Thermo	Thermo	Thermo	Cent.-pump	Cent.-pump
Cooling.....	Cent. pump	Cent.-pump	Cent.-pump	Cent.-pump	Cent.-pump	Fin. sheet	Fin. sheet	Fin. sheet	Fin. sheet	Fin. sheet	Fin. cast	Fin. cast
Radiator.....	Tube	Cell. sheet	Cell. sheet	Kingston h-t-m	Kingston h-t-m	Hennett	Hennett	Hennett	Hennett	Hennett	Kingston	Holley
Ignition.....	H-t-m	Dixie h-t-m	Dixie h-t-m	Kingston h-t-m	Kingston h-t-m	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Carburetor.....	Optional	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fuel, Gasoline.....	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fuel, Kerosene.....	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Governor, Type.....	Con. band	Disc	Disc	Centrifugal	Fly ball	Fly ball	Fly ball	Fly ball	Fly ball	Fly ball	Suction	Centrifugal
Clutch, Type.....	Con. band	Disc	Disc	Disc	Con. band	Exp.-shoe	Exp.-shoe	Exp.-shoe	Exp.-shoe	Exp.-shoe	Exp.-jaw	Disc
Control.....	Left	Right	Right	.....	.....	.....	.....	.....	.....	.....	.....	.....
Red. Gear, No.....	4	7	7	3	2	2	6	10	8	8	2	3
Drawbar, Type.....	Swinging	Swinging	Swinging	Rigid	Rigid	Swinging	Rigid	Swinging	Swinging	Rigid	Rigid	Swinging
Weight, Lbs.....	5200	.....	.....	.....	.....	8500	4900	9000	14,000	25,800	4500	6000
Make.....	"Baby John-son"	Common Sense	"Never Slip"	Automobile	Corn Belt	C. O. D.	Sandusky	Leader, Jr.	Leader	Leader	Denning	"Wadsworth"
Model.....	1916	.....	.....	.....	.....	B 1916	E	"9-15"	"12-18"	"25-40"	E	.....
Price.....	\$1395	.....	.....	\$1085	\$750	\$785	\$2000	\$695	\$890	\$1550	\$850	\$800
Drawbar HP.....	15	12	12	12	8	13	15	9	12	25	10	6
Belt HP.....	25	20	20	20	18	25	35	15	18	40	18	.....
Wheelbase.....	114 in.	.....	.....	91 in.	62 in.	104 in.	100 in.	81 in.	91 in.	94 in.	85 in.	.....
Length Overall.....	140 in.	126 in.	126 in.	150 in.	150 in.	156 in.	147 in.	128 in.	114 in.	144 in.	120 in.	.....
Width Overall.....	74 in.	64 in.	64 in.	73 in.	84 in.	78 in.	84 in.	64 in.	64 in.	66 in.	56 in.	.....
Turning Circle.....	32 ft.	.....	.....	13 ft.	10 ft. 4 in.	22 ft.	18 ft.	24 ft.	30 ft.	24 ft.	6 1/2 ft.	.....
Dia. F. Wheels.....	36 in.	.....	.....	36 in.	44 in.	34 in.	36 in.	34 in.	38 in.	38 in.	30 in.	.....
Dia. R. Wheels.....	62 in.	.....	.....	60 in.	40 in.	70 in.	56 in.	48 in.	54 in.	54 in.	46 in.	.....
Dia. Belt Pulley.....	22 in.	.....	.....	16 in.	12 in.	18 in.	15 in.	14 in.	14 in.	14 in.	10 in.	.....
Face, Belt Pulley.....	7 in.	.....	.....	8 in.	7 in.	8 in.	10 in.	7 in.	7 in.	7 in.	6 in.	.....
Engine, Type.....	4-cy. ver.	4-cy.	4-cy.	4-cy. ver.	4-cy. hor.	4-cy. hor.	4-cy. hor.	4-cy. hor.	4-cy. hor.	4-cy. ver.	4-cy. ver.	2-cy. hor.
Cyl. No.-Cast.....	4	2	2	4-block	2-single	2-single	4-single	2-single	2-single	4-pairs	4-block	1
Bore, Stroke.....	3 1/2 x 5 in.	6 x 6 1/2 in.	6 x 6 1/2 in.	3 1/2 x 5 in.	5 x 6 1/2 in.	5 x 6 1/2 in.	5 x 6 1/2 in.	5 x 6 1/2 in.	6 1/2 x 6 in.	6 x 7 in.	3 1/2 x 5 1/2 in.	.....
No. Main Bear.....	3	.....	.....	3	3	2	3	2	2	5	.....	.....
Speed, RPM.....	960	700	700	1150	.....	600	750	750	750	750	1200	.....
Road Speeds.....	1 1/2-10	2 1/2 x 3 1/2	2 1/2 x 3 1/2	3	1-5	2 1/2	2-3-5 1/2	2 1/2-4	2 1/2 x 4	2 1/2-3 1/2	3 1/2	.....
Lubrication.....	Spl.-pres.	Pressure	Pressure	Rotary pump	Spl.-pres.	Pump	Spl.-pres.	Spl.-pres.	Spl.-pres.	Spl.-pres.	Pressure	Splash
Cooling.....	Cent. pump	Cent. pump	Cent. pump	Rotary pump	Cent.-pump	Cent.-pump	Cent.-pump	Cent.-pump	Cent.-pump	Cent.-pump	Cent.-pump	Cent. pump
Radiator.....	Flat tube	Cell. cast	Cell. cast	Cast iron coils	Cell. cast	Cell. cast	Cell. cast	Cell. cast	Cell. cast	Cell. cast	Cell. cast	.....
Ignition.....	H-t-m	H-t-m	H-t-m	Kingston	H-t-m	Kingston	Kingston	Kingston	Kingston	Kingston	Dixie h-t-m	.....
Carburetor.....	Optional	Cast	Cast	Yes	Yes	Yes	Yes	Yes	Yes	Optional	Bennett	.....
Fuel, Gasoline.....	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	.....
Fuel, Kerosene.....	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Governor, Type.....	Kramer	Con.	Con.	Pierce	Gle	C. O. D.	Fly ball	Centrifugal	Centrifugal	Centrifugal	Waukesha	.....
Clutch, Type.....	Disc	.....	.....	Exp.-shoe	Friction drive	Cone	Exp.-shoe	Exp.-shoe	Cone	Cone	.....	.....
Control.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Red. Gear, No.....	Four	.....	.....	2	2	2	4	8	.....	6	.....	.....
Drawbar, Type.....	Rigid	.....	.....	Swinging	Swinging	Swinging	Spring	Rigid	Rigid	Rigid	.....	.....
Weight, Lbs.....	4500	5400	5400	.....	3800	6000	8000	.....	5000	6400	3600	.....

ABREVIATIONS AND DEFINITIONS.—**Drawbar HP**, rating in horsepower for road or field haulage. **Belt HP**, rating in power for stationary use. **Engine Type**, 2-cy. two-cycle; 4-cy. four-cycle; ver. vertical; horiz. horizontal; opp. opposed. **Cyl-How Cast**, number of cylinders and whether cast single, pairs, three or block. **Road-Speeds**, the speed in miles per hour when driven on the road or in the field. **Lubrication**, fuel-inj. injected with the fuel; splash, oil circulated by pump or other device; spl pres., combination of splash and pressure; cir-splash, circulating splash. **Cooling**, thermo, ther-mo-syphon circulation; pump, circulation forced by pump; cent.-pump, circulation by centrifugal pump; oil cir. cooled by circulation of oil; air, cooled by circulation of air only. **Radiator**, fin-sheet, finned tube core with sheet metal case; fin-cast, finned tube core with cast metal case; cell-sheet, cellular or honeycomb core and cast metal case; tank, water flows through cooling tank; tube or tubular radiator of large tube with metal base and head. **Ignition**, name of maker and h-t-m, high-tension magneto; name of maker and m and b, make and break magneto; timer, timer and battery distributor; distributor, distributor and battery. **Carburetor**, name of maker only. **Fuel**, "Yes" indicates the character of fuel in the specification; dis, distillate; optional, that either gasoline or kerosene may be used. **Governor**, type indicated unless name of maker is given. **Clutch**, exp shoe, expanding shoe; con. band, contracting band; disc, type of clutch but not whether dry or lubricated. **Reduction Gears**, number of gears in the reduction gearset. **Drawbar**, whether the drawbar is rigid, movable or adjustable.

# 310 MECHANICAL SPECIFICATIONS OF 1916 AMERICAN AGRICULTURAL OR ROAD TRACTORS.

These Data Are of 159 Different Types or Sizes of Machines, Built by 106 Concerns, Burning Gasoline, Kerosene, Distillate or Combinations of These Fuels.

Make.....	Wadsworth	Diamond	Dill	Eagle	Eagle	Engle	"Allwork"	Dakota	Emerson L	Big Four	Big Four
Model.....	Price.....	Model.....	Price.....	Model.....	Price.....	Model.....	Price.....	Model.....	Price.....	Model.....	Price.....
Drawbar HP.....	12	20	18	12	12	16	25	14	12	20	30
Helt HP.....	8	40	144 in.	81 in.	87 in.	87 in.	80 in.	88 in.	93 in.	135 in.	133 in.
Wheelbase.....	123 in.	104 in.	104 in.	123 in.	135 in.	135 in.	126 in.	156 in.	186 in.	196 in.	160 in.
Length Overall.....	28 ft.	28 ft.	28 ft.	28 ft.	28 ft.	28 ft.	32 ft.	38 ft.	38 ft.	38 ft.	50 ft.
Turning Circle.....	42 in.	44 in.	44 in.	44 in.	44 in.	44 in.	44 in.	44 in.	44 in.	44 in.	57 1/2 in.
Dia. F. Wheels.....	66 in.	66 in.	66 in.	66 in.	66 in.	66 in.	66 in.	66 in.	66 in.	66 in.	99 in.
Dia. R. Wheels.....	18 in.	18 in.	18 in.	18 in.	18 in.	18 in.	18 in.	18 in.	18 in.	18 in.	23 1/2 in.
Dia. Helt Pulley.....	10 in.	10 in.	10 in.	10 in.	10 in.	10 in.	10 in.	10 in.	10 in.	10 in.	9 in.
Face, Helt Pulley.....	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.
Engine, Type.....	opp. 2-cy.-hor.	opp. 2-cy.-hor.	opp. 2-cy.-hor.	opp. 2-cy.-hor.	opp. 2-cy.-hor.	opp. 2-cy.-hor.	opp. 2-cy.-hor.	opp. 2-cy.-hor.	opp. 2-cy.-hor.	opp. 2-cy.-hor.	opp. 2-cy.-hor.
Cyl. No.-Cast.....	1	4-block	4-block	4-block	4-block	4-block	4-block	4-block	4-block	4-block	4-block
Bore, Stroke.....	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2	3 1/2 x 5 1/2
No. Main Bear.....	600	600	600	600	600	600	600	600	600	600	600
Speed, RPM.....	1 1/2-2	1 1/2-2	1 1/2-2	1 1/2-2	1 1/2-2	1 1/2-2	1 1/2-2	1 1/2-2	1 1/2-2	1 1/2-2	1 1/2-2
Road Speeds.....	Splashes	Splashes	Splashes	Splashes	Splashes	Splashes	Splashes	Splashes	Splashes	Splashes	Splashes
Lubrication.....	Cent. pump	Cent. pump	Cent. pump	Cent. pump	Cent. pump	Cent. pump	Cent. pump	Cent. pump	Cent. pump	Cent. pump	Cent. pump
Cooling.....	Cell. cast	Cell. cast	Cell. cast	Cell. cast	Cell. cast	Cell. cast	Cell. cast	Cell. cast	Cell. cast	Cell. cast	Cell. cast
Radiator.....	H-t-m	H-t-m	H-t-m	H-t-m	H-t-m	H-t-m	H-t-m	H-t-m	H-t-m	H-t-m	H-t-m
Ignition.....	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Carburetor.....	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fuel, Gasoline.....	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fuel, Kerosene.....	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Governor, Type.....	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal
Clutch, Type.....	Disc	Disc	Disc	Disc	Disc	Disc	Disc	Disc	Disc	Disc	Disc
Control.....	Self-adjusting	Self-adjusting	Self-adjusting	Self-adjusting	Self-adjusting	Self-adjusting	Self-adjusting	Self-adjusting	Self-adjusting	Self-adjusting	Self-adjusting
Red. Gear, No.....	4800	4800	4800	4800	4800	4800	4800	4800	4800	4800	4800
Drawbar, Type.....	Swinging	Swinging	Swinging	Swinging	Swinging	Swinging	Swinging	Swinging	Swinging	Swinging	Swinging
Weight, Lbs.....	4800	4800	4800	4800	4800	4800	4800	4800	4800	4800	4800

Make.....	Auto "Happy er"	3 Wheel Farm-Michigan	Hart-Parr Little Devil	Hart-Parr Crop Maker	Hart-Parr Oil King	Hart-Parr Steel King	Hart-Parr Old Reliable	"Hoke"	"Caterpillar"	"75"	"Caterpillar"	"Huber"
Model.....	4											
Price.....	\$550	\$1600	15	17	23	27	38	11				\$1800
Drawbar HP.....	8	50	22	27	35	40	60	22		50		20
Belt HP.....	16									75		40
Wheelbase.....		123 in.	92 in.	108 in.	108 in.	136 in.	121 in.					
Length Overall.....	156 in.	185 in.	163 in.	107 1/2 in.	107 1/2 in.	191 in.	200 in.	158 in.				179 in.
Width Overall.....	72 in.	75 in.	95 1/2 in.	72 in.	72 in.	95 in.	106 in.	60 in.				104 in.
Turning Circle.....	18 ft.	6 ft.	30 ft.	32 ft. 8 in.	32 ft. 8 in.	40 ft.	50 ft. 6 in.	12 ft. 11 in.				20 ft.
Dia. F. Wheels.....	31 in.	42 in.	33 in.	40 in.	40 in.	51 in.	44 in.	60 in.				34 in.
Dia. R. Wheels.....	56 in.	54 in.	64 in.	74 in.	74 in.	73 in.	66 in.	60 in.				54 in.
Dia. Belt Pulley.....	11 in.	12 in.	16 in.	22 in.	23 1/2 in.	30 in.	40 in.	10 in.				15 in.
Face, Belt Pul. 8 in.	6 in.	7 in.	7 in.	8 in.	9 in.	9 in.	12 in.	8 in.				8 in.
Engine, Type.....	4-cy.-hor. opp.	4-cy.-ver.	2-cy.-hor.	4-cy.-ver.	4-cy.-ver.	2-cy.-ver.	4-cy.-hor.	4-cy.-ver.				4-cy.-hor. opp.
Cyl. No.-Cast.....	2-single	4-pairs	2-block	1-single	1-single	2-single	2-single	4-block				2-single
Bore, Stroke.....	4 1/2 x 6 1/2 in.	4 3/4 x 6 1/2 in.	5 1/2 x 7 in.	8 1/2 x 10 in.	10 x 10 in.	8 x 12 in.	10 x 15 in.	4 1/2 x 5 3/4 in.				7 1/2 x 8 in.
No. Main Bear. 5	3	3	3	2	2	2	2					5
Speed, RPM.....	750	1000	600	500	500	400	300	900				550
Road RPMs.....	2 1/2	1 1/2-2 1/4	2 1/2-3 3/4	1 1/2-2 1/2 in.	1 1/2-2 1/2	2-2 1/4	2-3	1 1/2-2 1/2				1 1/2-2 1/2
Lubrication.....	Pressure	Spl.-pres.	Pressure	Splash	Splash	Splash	Pressure	Spl.-pres.				Splash
Cent. pump.....	Cent. pump	Cent. pump	Thermo	Oil cl.	Oil cl.	Oil cl.	Oil cl.	Cent. pump				Cent. pump
Cell, east.....	Cell, east	Cell, east	Hart-Parr	Hart-Parr	Hart-Parr	Hart	Hart-Parr	Fin. tube				Fin. tube
Radiator.....	Radiator	Eise, h-t-m	Kingston h-t-m	Timer	Timer	Kingston h-t-m	Kingston h-t-m	K. W. h-t-m				Thinner
Carburetor.....	Carburetor	Yes	Yes	Yes	Yes	Yes	Yes	Yes				Yes
Fuel, Gasoline.....	Fuel, Gasoline	Yes	Yes	Yes	Yes	Yes	Yes	Yes				Yes
Governor, Type.....	Governor, Type	Waukesha	Fly ball	Fly ball	Fly ball	Pickering	Fly ball	Fly ball				Yes
Clutch, Type.....	Clutch, Type	Disc	Plate	Plate	Plate	Con.-shoe	Con.-shoe	Disc				Yes
Exp.-shoe.....	Exp.-shoe											
Red. Gears, No.....	Red. Gears, No.		5	6	6	6	4	3				
Drawbar, Type.....	Drawbar, Type	Rigid	Swinging	Swinging	Swinging	Swinging	Swinging	Optional				
Weight, Lbs.....	Weight, Lbs.	6647	11,250	11,500	11,600	15,200	20,100	4000				12,500
Make.....	Hume	Imperial	Independent	"Ingeco"	Mogul	Mogul	Titan	Titan	"15-30"	"30-60"	"Plough Boy"	Bates Steel Mule
Model.....	Hume Jr. 12-18											1914
Price.....	\$885	\$3000	\$1000	\$700	\$725		\$800					\$895
Drawbar HP.....	12	40	12	8	8	12	10	15				13
Belt HP.....	18	70	20	25	16	25	30	30				30
Wheelbase.....		137 in.			90 in.	104 in.	88 in.	86 in.				90 in.
Length Overall.....	144 in.	125 in.	125 in.	168 in.	135 in.	162 in.	147 in.	140 1/2 in.				132 in.
Width Overall.....	72 in.	110 in.		72 in.	56 in.	81 in.	60 in.	85 1/2 in.				102 in.
Turning Circle.....	9 ft.	25 ft.			20 ft.		28 ft.					8 1/2 ft. radius
Dia. F. Wheels.....	24 in.	60 in.	60 in.	36 in.	36 in.	40 in.	36 in.	40 in.				30 in.
Dia. R. Wheels.....	66 in.	96 in.	66 in.	66 in.	66 in.	60 in.	54 in.	66 in.				8 in.
Dia. Belt Pulley.....	12 in.	30 in.	14 in.	14 in.	22 in.	18 in.	20 in.	30 in.				30 in.
Face, Belt Pul. 7 in.	6 in.	12 in.		8 in.	10 1/2 in.	9 in.	8 1/2 in.	10 1/2 in.				8 1/2 in.
Engine, Type.....	4-cy.-ver.	4-cy.-hor. opp.	4-cy.-ver.	4-cy.-hor. opp.	4-cy.-hor.	4-cy.-ver.	4-cy.-hor. opp.	4-cy.-ver.				4-cy.-ver.
Cyl. No.-Cast.....	4-block	4-single	4-block	2-single	1-single	4	2-single	4-block				4-pairs
Bore, Stroke.....	3 1/2 x 5 1/2 in.	7 1/2 x 9 in.	5 1/2 x 7 in.	8 x 10 in.	8 x 10 in.	7 x 8 in.	6 1/2 x 8 1/2 in.	5 1/2 x 8 in.				4 1/2 x 5 1/2 in.
No. Main Bear. 3	3	5		2	2			3				3
Speed, RPM.....	1200			800	400		500					900
Road RPMs.....	2 1/2	1 1/2-2 1/4	2 1/2-3	2 1/2-3			375	2 1/2-3 1/4				2 1/3. 3 1/2
Lubrication.....	Spl. pres.	Spl.-pres.	Splash	Pressure	Pressure	Pressure	Pressure	Splash				Spl.-pres.
Cent. pump.....	Cent. pump	Cent. pump	Cent. pump	Cent. pump	Cent. pump	Cent. pump	Cent. pump	Cent. pump				Cent. pump
Cell, sheet.....	Cell, sheet	Cell, sheet	Cell, sheet	Cell, sheet	Cell, sheet	Cell, sheet	Cell, sheet	Cell, sheet				Fin. cast
Eise, h-t-m.....	Eise, h-t-m	Eise, h-t-m	H-t-m	H-t-m	L-t-m	L-t-m	H-t-m	H-t-m				H-t-m
Carburetor.....	Kingston	Kingston	Yes	Yes	Yes	Yes	Yes	Yes				Yes
Fuel, Gasoline.....	Fuel, Gasoline	Yes	Yes	Yes	Yes	Yes	Yes	Yes				Yes
Governor, Type.....	Governor, Type	Waukesha	Yes	Yes	Yes	Yes	Yes	Yes				Yes
Clutch, Type.....	Clutch, Type	Exp.-shoe	Exp.-shoe	Exp.-shoe	Exp.-shoe	Exp.-shoe	Exp.-shoe	Exp.-shoe				Centrifugal
Control.....	Control											Dry plate
Red. Gears, No.....	Red. Gears, No.											
Drawbar, Type.....	Drawbar, Type											
Weight, Lbs.....	Weight, Lbs.	21,000	3500	5000	5000	9585	5525	20,830				6000
												Compensating
												3200

**ABBREVIATIONS AND DEFINITIONS**—**Drawbar HP**, rating in horsepower for road or field haulage. **Belt HP**, rating in power for stationary use. **Engine "type"**, 2-cy. two-cycle; 4-cy. four-cycle; ver. vertical; horiz. horizontal; opp. opposed. **Cyl-How**, Cast, number of cylinders and whether cast single, pairs, three's or block. **Road-Speeds**, the speed, in miles per hour when driven on the road or in the field. **Lubrication**, fuel-injected with the fuel; splash, splash only; pressure, oil circulated by pump or other device; spl pres., combination of splash and pressure; cir-splash, circulating splash. **Cooling**, thermo, thermosiphon circulation; pump, circulation forced by pump; cent-pump, circulation by centrifugal pump; oil cir., cooled by circulation of oil; air, cooled by circulation of air only. **Radiator**, fin-sheet, finned tube core with sheet metal case; fin-tube core with tank; water-cooled, radiator of large tube with metal base and head. **Ignition**, name of maker and b-t-m, high-tension magneto; name of maker and m and b, make and break magneto; timer, timer and battery; distributor, distributor. **Fuel**, "yes" indicates the character of fuel in the specification; dis, distillate; optional, that either gasoline or kerosene may be used. **Governor**, type indicated unless name of maker is given. **Clutch**, exp shoe, expanding shoe; cont band, contracting band; **Dis**, type of clutch but not whether dry or lubricated. **Reduction Gears**, number of gears in the reduction gearset. **Drawbar**, whether the drawbar is rigid, movable or adjustable.



These Data Are of 159 Different Types or Sizes of Machines, Built by 106 Concerns, Burning Gasoline, Kerosene, Distillate or Combinations of These Fuels.

Make.....	K. C. Prairie "K. T." Dog	Strait	Strait	"Kinnard"	50-50	Flour City	Lauson	Lauson	Lawyer	"Master Key" Lion
Model.....	"A"	3	2	.....	.....	.....	"15-23"	"20-35"	.....	.....
Price.....	\$1000	.....	.....	\$1250	.....	\$1595	\$1250	\$1800	.....	\$565
Drawbar HP.....	14	15	30	15	30	40	15	20	18-20	8
Belt HP.....	25	30	50	25	50	35	25	35	38-40	16
Wheelbase.....	110 in.	.....	.....	.....	.....	108 in.	80 in.	104 in.	.....	80 in.
Length Overall.....	148 in.	154 in.	156 in.	.....	132 in.	.....	133 in.	161 in.	165 in.	124 in.
Width Overall.....	38 in.	70 in.	72 in.	.....	96 in.	.....	74 in.	84 in.	90 in.	78 in.
Turning Circle.....	38 ft.	16 ft.	216 in.	.....	.....	.....	25 ft.	28 ft.	13 ft. 9 in.	13 ft.
Dia. F. Wheels.....	36 in.	.....	.....	42 in.	42 in.	42 in.	32 in.	40 in.	48 in.	60 in.
Dia. R. Wheels.....	30 in.	.....	.....	60 in.	84 in.	72 in.	54 in.	66 in.	25 in.	28 in.
Dia. Belt Pulley.....	22 in.	10 in.	10 in.	14 in.	32 in.	26 in.	14 in.	20 in.	20 in.	12 in.
Face, Belt Pulley.....	5 in.	7 1/2 in.	7 1/2 in.	8 in.	9 in.	8 in.	8 in.	8 in.	8 in.	6 in.
Engine, Type.....	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-hor. opp.
Cyl. No.-Cast.....	4-pairs	4-pairs	4-pairs	4-block	4-pairs	4-block	4-block	4-block	4-pairs	2-single
Bore, Stroke.....	4 1/4 x 5 1/2 in.	3 1/4 x 5 1/2 in.	4 1/4 x 6 1/2 in.	4 1/4 x 5 in.	6 1/4 x 7 in.	5 1/4 x 6 in.	3 1/4 x 5 in.	4 1/4 x 6 in.	4 1/4 x 6 1/2 in.	5 x 6 1/2 in.
No. Main Bearings.....	3	3	3	3	3	3	3	3	3	3
Speed, RPM.....	850	900	900-1000	800	600	700	1100	900	500-1000	750
Road Speeds.....	2 1/4-3	2-3	2-3 1/2	2 1/2-4	2	2-2 1/2	1 1/2-2 1/2	1 1/2-2 1/2	3 1/4-4	2 1/2-5
Lubrication.....	Pressure	Pressure	Pressure	.....	Pressure	.....	Spl.-pres.	Spl.-pres.	Spl.-pres.	Spl.-pres.
Cooling.....	Cent. pump	Cent. pump	Cent. pump	.....	Cent. pump	Cent. pump	Cent. pump	Cent. pump	Cent. pump	Cent. pump
Radiator.....	Cell. cast	Cell. cast	Cell. cast	.....	Cell. cast	Cell. cast	Cell. cast	Cell. cast	Cell. cast	Cell. cast
Ignition.....	H-t-m	H-t-m	H-t-m	H-t-m	H-t-m	H-t-m	Dixie h-t-m	Dixie h-t-m	Kingston h-t-m	Opt. h-t-m
Carburetor.....	Optional	Holley	Holley	Holley	Holley	Holley	Lauson	Lauson	Bennett	Bennett
Fuel, Gasoline.....	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fuel, Kerosene.....	.....	Yes	Yes	Yes	Yes	Yes	Suction	Suction	.....	.....
Governor, Type.....	Con. band	Centrifugal	Centrifugal	.....	.....	.....	.....	.....	Exp.-shoe	Fly ball
Clutch, Type.....	Exp.-shoe	.....	.....	.....	.....	.....	.....	.....	.....	Exp. shoe
Control.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Red. Gears, No.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Drawbar, Type.....	Rigid	Swivel	Swivel	.....	.....	.....	.....	.....	Swinging	Swinging
Weight, Lbs.....	5500	4800	9000	7900	13,500	9500	5500	7500	3650	3600

Make.....	"Farmer Boy"	"Little Giant B"	"Little Giant A"	Maytag	Twain City	Twain City	Twain City	"Milanapolis"	Moline-Unit-Verbal	Morton	Paramount
Model.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	A
Price.....	\$750	\$1250	\$2000	\$975	\$2000	.....	.....	\$1000	\$790	\$5400	\$785
Drawbar HP.....	10	16	26	12	25	40	60	.....	5-7	30	10
Belt HP.....	25	22	35	30	45	65	95	.....	10-12	80	20
Wheelbase.....	87 in.	156 in.	180 in.	156 in.	126 in.	144 in.	168 in.	.....	.....	.....	82 in.
Length Overall.....	136 in.	52 in.	75 in.	72 in.	80 in.	98 1/2 in.	264 in.	168 in.	152 in.	228 in.	144 in.
Turning Circle.....	52 in.	20 ft.	30 ft.	.....	37 ft.	42 ft. 7 in.	48 ft. 3 in.	72 in.	54 in.	78 in.	72 in.
Dia. F. Wheels.....	22 1/2 in.	30 in.	37 in.	30 in.	42 in.	42 in.	42 in.	32 in.	16 ft. 8 in.	50 in.	10 ft.
Dia. R. Wheels.....	12 in.	54 in.	66 in.	66 in.	84 in.	84 in.	84 in.	56 in.	52 in.	50 in.	30 in.
Dia. Belt Pulley.....	12 in.	9 in.	13 in.	22 in.	8 1/2 in.	23 in.	23 in.	15 in.	.....	50 in.	54 in.
Face, Belt Pulley.....	6 in.	7 in.	9 in.	8 1/2 in.	8 1/2 in.	10 1/2 in.	10 1/2 in.	6 1/2 in.	8 in.	Optional	7 in.
Engine, Type.....	4-cy.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-hor. opp.	4-cy.-ver.	4-cy.-ver.
Cyl. No.-Cast.....	4	4-pairs	4-pairs	4-block	4-pairs	4-single	4-single	4-pairs	2-block	4-pairs	4-single
Bore, Stroke.....	4 1/4 x 5 in.	5 1/4 x 6 in.	4 1/4 x 5 1/2 in.	4 1/4 x 5 1/2 in.	6 x 8 in.	7 1/4 x 9 in.	7 1/4 x 9 in.	4 1/4 x 7 in.	4 1/4 x 6 in.	.....	3 1/4 x 5 1/2 in.
No. Main Bearings.....	3	3	3	3	3	5	7	.....	2	.....	3
Speed, RPM.....	900	750	1000	1000	600	500	500	750	1500	800	900
Road Speeds.....	2-2 1/2	1 1/2-3-6	1 1/2-3-6	2 1/2-3	1 1/2-2 1/2	2	2	2 1/2-3	1 1/2-3 1/4	8	2 1/2-3
Lubrication.....	Spl.-pres.	Spl.-pres.	Spl.-pres.	Spl.-pres.	Pressure	Pressure	Pressure	Spl.-pres.	Pressure	.....	Spl.-pres.
Cooling.....	Cent. pump	Cent. pump	Cent. pump	Cent. pump	Pump	Pump	Pump	Cent. pump	Cent. pump	.....	Cent. pump
Radiator.....	Cell. cast	Cell. cast	Cell. cast	Cell. cast	Fin. cast	Fin. cast	Fin. cast	Cell. sheet	Cell. sheet	.....	Cell. sheet
Ignition.....	H-t-m	H-t-m	H-t-m	H-t-m	.....	.....	.....	H-t-m	Dixie h-t-m	.....	Dixie h-t-m
Carburetor.....	Schebler	Schebler	Schebler	Schebler	.....	.....	.....	.....	Holley	.....	Bennett
Fuel, Gasoline.....	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	.....	Yes
Fuel, Kerosene.....	Yes	Yes	Yes	Yes	Yes	Yes	Yes	.....	.....	.....	Yes
Governor, Type.....	Cent.	Cent.	Cent.	Cent.	.....	.....	.....	Cone	.....	.....	Pierce
Clutch, Type.....	Cone	Cone	Cone	Cone	.....	.....	.....	.....	.....	.....	Exp.-shoe
Control.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Red. Gears, No.....	3	3	3	.....	.....	.....	.....	.....	4	.....	6
Drawbar, Type.....	Swinging	Swinging	Swinging	.....	.....	.....	.....	.....	.....	.....	Swinging
Weight, Lbs.....	2500	5000	8700	5700	12,850	19,150	21,150	5600	2900	14,000	3800

Make.....	Paramount	"New Age"	"Nichols & Shepherd"	Nilson	Ohio	Ohio	Ohio	Ohio	Ohio	"Parker Motor Plow"	Parrett "All Peoria Purpose"	"Phoenix Cam-Pioneer, Jr. tipped"	"20-45"
Model.....	B												
Price.....	\$900	\$750		\$1485	\$650	\$2800	\$1200	\$375	\$1075	\$685	\$4000	\$1750	
Drawbar HP.....	12	10	25	36	12	15	13	3	10	8	35	20	
Belt HP.....	25	18	50	100	12	30	25	10	25	30	50	45	
Wheelbase.....	52 in.	125 in.		164 in.	123 in.	128 in.	132 in.		92 in.	126 in.		105 in.	
Length Overall.....	144 in.	132 in.		88 1/2 in.	166 in.	201 in.	72 in.		144 in.	162 in.		166 in.	
Turning Circle.....	72 in.	73 in.		34 ft.	16 ft.	80 in.	72 in.		72 in.	78 in.		78 in.	
Dia. F. Wheel.....	30 in.	16 ft.		36 in.	32 in.	28 ft.	22 ft.		22 ft.	20 ft.		35 ft.	
Dia. R. Wheel.....	34 in.			32 in.	36 in.	44 in.	46 in.		46 in.	38 in.		40 in.	
Dia. Belt Pulley.....	10 1/2 in.			52 in.	64 in.	70 in.	60 in.		60 in.	60 in.		72 in.	
Face, Belt Pulley.....	10 1/2 in.			18 in.	22 in.	28 in.	15 in.		15 in.	10 in.		14 in.	
Engine, Type.....	4-cy.-hor. opp.	4-cy.-hor. opp.	4-cy.-hor. opp.	4-cy.-ver.	4-cy.-hor.	4-cy.-hor.	4-cy.-ver.		4-cy.-ver.	4-cy.-ver.		4-cy.-hor. opp.	
Cyl. No.-Cant.....	4-single	2-single	2-single	4-pairs	2-single	2-single	4-pairs		4-cy.-ver.	4-cy.-ver.		4-cy.-hor.	
Bore, Stroke.....	4 1/2 x 5 1/2 in.	3 x 6 1/2 in.	9 x 12 in.	4 1/2 x 6 1/2 in.	4 1/2 x 5 in.	8 1/2 x 12 in.	5 x 6 in.		2-single	4-block		5 1/2 x 7 in.	
No. Main Bear.....	3			3	3	3	3		3	3		3	
Speed, RPM.....	800	800	420	800	1200	300	500		900	700		625	
Road Speed.....	2 1/2	2 1/2	1 1/2-2 1/2	2.57-4.74	1 1/2-4	1 1/2-2 1/2	1 1/2-3		2-4	2 1/2-3		2 1/2-3	
Lubrication.....	Spl.-pres.	Spl.-pres.	Spl.-pres.	Spl.-pres.	Spl.-pres.	Pressure	Pressure		Spl.-pres.	Pressure		Spl.-pres.	
Cooling.....	Cent. pump	Cent. pump	Cent. pump	Cent. pump	Cent. pump	Cent. pump	Cent. pump		Cent. pump	Cent. pump		Cent. pump	
Radiator.....	Tubular	Tubular	Timer	Cell. cast	Tubular	Tube	Cell. cast		Cell. cast	Cell. cast		Cell. cast	
Ignition.....	Dixie h-t-m	H-t-m	Timer	K. W. h-t-m	H-t-m	H-t-m	Timer		Dixie h-t-m	Else. h-t-m		H-t-m	
Carburetor.....	Bennett			Kingston	Wilcox-Ben.	Yes	Yes		Optional	Stromberg		Kingston	
Fuel, Gasoline.....	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Optional	Yes		Yes	
Fuel, Kerosene.....	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Optional	Yes		Yes	
Governor, Type.....	Pierce			Centrifugal	Throttling	Friction	Con. band		Ball	Fly ball		Fly ball	
Clutch, Type.....	Exp.-shoe			Exp.-shoe	Con. band	Friction	Con. band		Cone	Exp.-shoe		Disc	
Control.....													
Red. Gears, No.....	6			2	6	6							
Drawbar, Type.....	Swinging			Nilson pat.	Rigid	Rigid			Swinging	Floating		Rigid	
Weight, Lbs.....	4000	4100	13,000		2600		4800		4000	3950		16,800	
Make.....	Pioneer Pony	Pioneer 30	Straddle Row-Holder Universal	"Hoosier"	Runwell	"St. Paul"			Samsom	Samsom	Sieve Simplex	Standard-De-	Stirte
Model.....	"30-60"	A		"C"					R	S		"C"	
Price.....	\$2850	\$1000		\$995					\$725	\$1250		\$1065	
Drawbar HP.....	15	15		8	12	20	20		6	10		10	
Belt HP.....	30	30		20	24	40	40		12	25		25	
Wheelbase.....	156 in.	72 in.		96 in.					138 in.	145 in.		108 in.	
Length Overall.....	137 in.	132 in.		144 in.	139 in.	67 in.	88 in.		54 in.	62 in.		173 in.	
Turning Circle.....	57 in.	5 ft.		25 ft.					15 ft.	18 ft.		74 in.	
Dia. F. Wheel.....	60 in.	36 in.		30 in.	30 in.	30 in.	42 in.		28 in.	36 in.		30 ft.	
Dia. R. Wheel.....	60 in.	54 in.		57 in.	53 in.	53 in.	66 in.		40 in.	60 in.		24 ft.	
Dia. Belt Pulley.....	12 in.	12 in.		14 in.	20 in.	12 1/2 in.	20 in.		40 in.	40 in.		45 in.	
Face, Belt Pulley.....	10 in.	7 in.		7 in.	7 in.	8 in.	8 in.		12-15	14 in.		10 in.	
Engine, Type.....	4-cy.-hor. opp.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.	4-cy.-ver.		4-cy.-hor.	4-cy.-hor.		4-cy.-ver.	
Cyl. No.-Cant.....	4-pairs	4-block	4-pairs	4-pairs	4-block	4-block	4-pairs		4-pairs	4-pairs		4-block	
Bore, Stroke.....	5 x 6 in.	4 1/2 x 5 1/2 in.	4 1/2 x 6 1/2 in.	4 1/2 x 6 1/2 in.	7 x 9 in.	7 x 9 in.	5 x 5 in.		4-pairs	5 x 5 in.		3 1/2 x 5 in.	
No. Main Bear.....	2	5	3	3	2	2	2		3	2		3	
Speed, RPM.....	650	800	750	750	750	750	650		650	750		1200	
Road Speed.....	2-3-6	1 1/2-3-5	1 1/2-3-5	1 1/2-2 1/2	1 1/2-3 1/2	1 1/2-3 1/2	2 1/2		3-3 1/2	1.66-2.32-3		2 1/2-3	
Lubrication.....	Pressure	Spl.-pres.	Spl.-pres.	Spl.-pres.	Spl.-pres.	Spl.-pres.	Spl.-pres.		Spl.-pres.	Spl.-pres.		Pressure	
Cooling.....	Cent. pump	Cent. pump	Cent. pump	Spl.-pres.	Cent. pump	Cent. pump	Cent. pump		Cent. pump	Cent. pump		Cent. pump	
Radiator.....	Fin. tube	Tubular	Tubular	Cell. cast	Tubular	Tubular	Tubular		Cent. pump	Cent. pump		Cell. sheet	
Ignition.....	K. W. h-t-m	Bosch h-t-m	Bosch h-t-m	Cell. cast	Atwater	Kent Ont. h-t-m	Kingston		Kingston	Kingston		Kingston	
Carburetor.....	Kingston	Yes	Yes	Yes	Holley	Holley	Holley		Holley	Holley		Holley	
Fuel, Gasoline.....	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Distillate	Distillate		Gasoline	
Fuel, Kerosene.....	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	
Governor, Type.....	Fly ball	Centrifugal	Centrifugal	Fly ball	Exp.-shoe	Exp.-shoe	Exp.-shoe		Throttling	Throttling		Kramer	
Clutch, Type.....	Con. band	Disc	Disc	Friction	Exp.-shoe	Exp.-shoe	Exp.-shoe		Exp.-shoe	Exp.-shoe		Exp.-shoe	
Control.....													
Red. Gears, No.....	Spur								2	2			
Drawbar, Type.....	Adjustable			Swinging					Rigid	Rigid		Adjustable	
Weight, Lbs.....	22,000	5000	5800	5800		10,000			5000	5000		4000	

ABREVIATIONS AND DEFINITIONS.—Drawbar HP rating in horsepower for road or field haulage. Belt HP, rating in power for stationary use. Engine Type, 2-cy. two-cycle; 4-cy. four-cycle; ver. vertical; horz. horizontal; opp. opposed. Cyl.-How Cant, number of cylinders and whether cast single, pairs, threes or block. Road-Speeds, the speed in miles per hour when driven on the road or in the field. Lubrication, fuel-inj. injected with the fuel; splash, splash only; pressure, oil circulated by pump or other device; spl. pres. combination of splash and pressure; cir.-splash, circulating splash. Cooling, thermo, ther. mo-syphon circulation; pump, circulation forced by pump; cent.-pump, circulation by centrifugal pump; oil ctr. cooled by circulation of oil; air, cooled by circulation of air only. Radiator, fin.-sheet, finned tube core with sheet metal case; fin.-cast, finned tube core with cast metal case; cell.-sheet, cellular or honeycomb core and sheet metal case; cell. sheet, cellular or honeycomb core and cast metal case; tank, water flows through cooling tank; tube or tubular, radiator of large tube with metal base and head. Ignition, name of maker and h-t-m, high-tension magneto; name of maker and 1-t-m, low-tension magneto; name of maker and m and h, make and break magneto; timer, timer and battery; distributor, distributor and battery. Carburetor, name of maker only. Fuel, "Yes" indicates the character of fuel in the specification; dis. distillate; optional, that either gasoline or kerosene may be used. Governor, type indicated unless name of maker is given. Clutch, exp. shoe, expanding shoe; con. band, contracting band; disc, type of clutch but not whether dry or lubricated. Reduction Gears, number of gears in the reduction gearset. Drawbar, whether the drawbar is rigid, movable or adjustable.

These Data Are of 159 Different Types or Sizes of Machines, Built by 103 Concerns, Burning Gasoline, Kerosene, Distillate or Combinations of These Fuels.

Make.....	Iron Horse	"Sullivan"	Tom Thumb	Townsend	"Ideal Crawl- er"	Walter	Walla Cab	Ward	Waterloo Boy	"Weber"	Little Oak
Model.....	D		B			A	D		R		
Price.....	\$985	\$1375	\$1000	\$1000	\$1050	\$800	\$1750	\$1500	\$750	\$1750	\$1400
Drawbar HP.....	15	10	12	10	6	8	26 1/4	15	12	20	22
Belt HP.....	25	20	20	20	20	16	44	25	25	44	44
Wheelbase.....	90 in.	84 in.	84 in.	84 in.	84 in.	87 in.	102 1/2 in.	144 in.	90 in.	114 in.	114 in.
Length Overall.....	156 in.	108 in.	128 in.	140 in.	136 in.	130 in.	13 1/2 in.	144 in.	132 in.	168 in.	168 in.
Width Overall.....	78 in.	58 in.	88 in.	78 in.	60 in.	60 in.	74 in.	11 in.	72 in.	92 in.	92 in.
Turning Circle.....	20 ft.	13 ft.	16 ft.	15 ft.	4 ft. 4 in.	28 ft.	17 ft.	34 in.	25 ft.	32 in.	27 in.
Dia. F. Wheels.....	24 in.	42 in.	32 in.	32 in.	32 in.	34 in.	34 in.	60 in.	32 in.	32 in.	32 in.
Dia. R. Wheels.....	48 in.	.....	56 in.	56 in.	56 in.	42 in.	60 in.	60 in.	54 in.	69 in.	69 in.
Dia. Belt Pulley.....	10 in.	.....	16 in.	20 in.	.....	9 in.	14 in.	16 in.	14 in.	30 in.	30 in.
Face, Belt Pulley.....	10 in.	.....	7 in.	8 in.	.....	9 in.	9 in.	8 in.	8 in.	8 in.	8 in.
Engine, Type.....	4-cy-ver.	4-cy-ver.	4-cy-hor.	4-cy-hor.	4-cy-hor.	4-cy-ver.	4-cy-ver.	2-cy-hor.	4-cy-ver.	4-cy-ver.	4-cy-ver.
Cyl. No.-Cast.....	6-block	4-block	2-block	2-block	2-single	4-block	4-pairs	2-cyl. 1-cyl.	4-pairs	4-pairs	4-single
Bore, Stroke.....	3 1/2 x 5 in.	4 3/4 x 5 in.	4 1/2 x 5 1/2 in.	6 x 8 in.	3 1/2 x 5 in.	3 1/2 x 5 1/2 in.	6 x 7 in.	.....	4 3/4 x 6 1/2 in.	4 3/4 x 6 1/2 in.	5 1/2 x 7 1/2 in.
No. Main Bear.....	3	3	3	2	2	3	5	.....	2	5	5
Speed, RPM.....	1000	700	800	500	700	1000	650	600	800	800	600
Road Speeds.....	2 1/2-3 1/4	2 1/2	2 1-2 1/2	2-2 1/2	3 1/2	1-3 1/2	2 1/2-3 1/2	2 1/2-3	2 1/2-3	2-6	4
Lubrication.....	Spl.-pres.	Spl.-pres.	Pressure	Pressure	Pressure	Spl.-pres.	Pressure	Pressure	Pressure	Pressure	Spl.-pres.
Cooling.....	Cent. pump	Cent. pump	Cent. pump	Cent. pump	Cent. pump	Thermo	Cent. pump	Cent. pump	Cent. pump	Cent. pump	Cent. pump
Radiator.....	Cell. cast	Cell. cast	Cell. cast	Cell. cast	Cell. cast	Cell. cast	Cell. cast	Cell. cast	Cell. cast	Cell. cast	Cell. cast
Ignition.....	Elise. h-t-m	H-t-m	Dixie h-t-m	H-t-m	H-t-m	H-t-m	Kingston h-t-m	H-t-m	H-t-m	H-t-m	L-t-m
Carburetor.....	Kingston	.....	Bennett	.....	.....	.....	Optional	.....	.....	.....	Kingston
Fuel, Gasoline.....	Yes	Distillate	Yes	Yes	Distillate	Optional	Yes	Yes	Yes	Yes	Yes
Fuel, Kerosene.....	.....	.....	Yes	Yes	Yes	Optional	Yes	Yes	Yes	Yes	Yes
Governor, Type.....	Fly ball	.....	Centrifugal	.....	.....	Optional	Hydraulic	.....	.....	.....	.....
Clutch, Type.....	Exp.-shoe	.....	Exp.-shoe	Cont. band	Cont. band	Friction	Three plate	Cont. band	Cont. band	Cont. band	Exp.-shoe
Control.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Red. Gears, No. 1.....	4	4	4	4	4	2	3 sets	.....	.....	.....	.....
Drawbar, Type.....	Rigid	Adjustable	Adjustable	Rigid	.....	Swing-adj.	Swinging	.....	Swinging	Swinging	Rigid
Weight, Lbs.....	5000	4500	5000	5500	5000	2700	5500	.....	7500	7500	8500

Make....."Wolverine"

Model.....	1917	18
Price.....	\$2250	\$3000
Drawbar HP.....	17	18
Belt HP.....	25	35
Wheelbase.....	72 in.	162 in.
Length Overall.....	144 in.	73 in.
Width Overall.....	66 in.	69 in.
Turning Circle.....	20 ft.	16 ft.
Dia. F. Wheels.....	30 in.	32 in.
Dia. R. Wheels.....	40 in.	48 in.
Dia. Belt Pulley.....	8 in.	12-14 in.
Face, Belt Pulley.....	8 in.	6 1/2 in.
Engine, Type.....	4-cy-ver.	4-cy-ver.
Cyl. No.-Cast.....	4-block	4-pairs
Bore, Stroke.....	3 1/2 x 5 in.	4 1/2 x 5 1/2 in.
No. Main Bear.....	3	700
Speed, RPM.....	1000	700
Road Speeds.....	2 1/2-3 1/4	2 1/2-3 1/4
Lubrication.....	Spl.-pres.	Spl.-pres.
Cooling.....	Cent. pump	Cent. pump
Radiator.....	Cell. cast	Flat tube
Ignition.....	Elise. h-t-m	Bosch h-t-m
Carburetor.....	Kingston	Master
Fuel, Gasoline.....	.....	Distillate
Fuel, Kerosene.....	.....	.....
Governor, Type.....	Fly ball	Fly ball
Clutch, Type.....	Exp.-shoe	Disc
Control.....	.....	.....
Red. Gears, No. 12.....	.....	.....
Drawbar, Type.....	Swinging	Rigid
Weight, Lbs.....	4400	9000

## Supplementary Mechanical Detail of Tractors.

The specifications of agricultural and road tractors given in the foregoing tabulations are the most complete that have ever been published, this being with reference to number of manufacturers, the trade names and the mechanical details of the machines. This list is absolutely complete to date, and the purpose is to supplement it from time to time with other information of a similar character.

So far as possible the specifications have been given in mechanical terms that have been adopted as standard nomenclature by the automobile vehicle industry, but because of the variance from automobile practice and the fact that there are no generally accepted definitions for some of the forms of construction, these do not as a rule as fully describe the methods of driving as might be desired. This detail of information can only be obtained from individual description, such as is found in the catalogues of the builders.

**PACKARD INCREASES NEW YORK FORCE.**

During the past year the business of the Packard Motor Car Company of New York has increased so rapidly that it has been necessary to increase its facilities. The admin-



**Emlen S. Hare, Manager, Sales Department, Packard Motor Car Company of New York.**

istration duties have grown proportionately and to take care of the expansion in the sales department the company has appointed Emlen S. Hare as manager. Mr. Hare has had wide experience selling motor vehicles, having been vice president of the Commercial Truck Company of America, of Philadelphia, from 1909 to 1916. He joined the Packard organization Jan. 1, 1916, as a special representative of the motor truck department and since then has become conspicuous for several large sales he consummated. It was because of his success that he was chosen as manager of the New York sales department to co-ordinate the Packard company's combined selling functions.

**MANUFACTURERS' SERVICE BUREAU.**

For the sole purpose of acting among the companies in Detroit as personal representative for the distributors and manufacturers of the country, Wallace C. Hood, former general sales manager of the Chalmers Motor Company, the Everitt Motor Car Company and the Empire Automobile Company, has organized the Wallace C. Hood Service Bureau, with offices in the Dime Bank building. The personnel of the bureau includes several men prominently known in the industry.



**Wallace C. Hood, Head of Manufacturers' Service Bureau, Detroit, Mich.**

Mr. Hood explains that it is his plan "to serve automobile manufacturers and big automobile distributors who have been working at a considerable disadvantage

through lack of representation in Detroit and Michigan. The Wallace C. Hood Service Bureau will maintain close communication with these manufacturers and distributors and will facilitate the management of their business by attending to their most necessary work in the manufacturing centre of Michigan."

**D. K. MOORE JOINS VIM COMPANY.**

The appointment of D. K. Moore as assistant to the general manager for production of the Vim Motor Truck Company has been announced by General Manager Larzelere. Mr. Moore will devote his attention to supervising production and taking charge of materials, duties for which he is eminently suited through his long experience. Mr. Moore has been connected with companies of high repute as the Federal Manufacturing Company, the Crosby Company and the American Distributing Company, of which he was president. For the past five years he has been sales manager for the Weston-Mott Company and the Northway Motor Company.



**D. K. Moore, Assistant Production Manager, Vim Motor Truck Company.**

**MATT R. KORSHIN WITH ATTERBURY.**

Matt R. Korshin, well known in the automobile business in New England for the past 15 years, has been appointed district sales manager in New England for the Atterbury Motor Car Company of Buffalo, N. Y., manufacturer of Atterbury trucks.

For the past two years Mr. Korshin has been New England manager of the Polack Tyre Company, with headquarters in Boston. Previous to that time he was connected with the Warner Instrument Company's sales force.



**Matt R. Korshin, New England Sales Manager, Atterbury Motor Car Company.**



Republic Trucks Equipped with a Big Passenger Body, Used for Conveying Sightseeing Parties Through Yosemite Valley, Calif.

### SELDEN TRUCKS AID RECRUITING.

Many men were recently induced to enlist in the United States army and navy through the good offices of President Miltenberger of the Manhattan Motors Corporation, which handles Selden and Vim commercial cars at Broadway and Fifty-sixth street, New York City. Mr. Miltenberger believes in "preparedness" and noticing the slowness with which volunteers were enlisting at the little tents of the army and navy in Columbus circle, offered two Selden army transports to the recruiting officers to stimulate interest. The machines were loaded with full recruiting paraphernalia and made tours of the city, thereby attracting many men to the colors.

### BIG EARNINGS FROM AUTO SHIPMENTS.

Representatives of the members of the National Automobile Chamber of Commerce recently held a meeting at the Detroit Board of Commerce to discuss the freight situation. J. S. Marvin, traffic manager of the chamber, presided. Subjects to be considered by the Official Classification Committee were the main points of discussion.

One of the feature announcements of the meeting was that shipments of automobiles from the factories continue in record volume and that the 1917 business is getting underway very rapidly. In June 23,879 car loads were shipped, compared with 17,075 car loads in June, 1915. For the six months ending June 30 shipments reached the immense total of 151,163 car loads, compared with 89,613 carloads for the same period in 1915. Mr. Marvin estimated that the earnings of railroads from shipments of finished products

alone from automobile and truck factories will exceed \$35,000,000 for the current year. Adding this to the earnings on inward freight, such as tires, bodies stampings, wheels, etc., the automobile industry has become one of the greatest sources of revenue for the railroads.

### KISSEL IS OPTIMISTIC.

President George A. Kissel of the Kissel Motor Car Company, Hartford, Wis., is very optimistic as to the future of the truck business. "Truck manufacture is in a substantial position and standing on sound ground," says Mr. Kissel. "It is reaping the fruition of several years of hard campaigning to uproot prejudice and teach the superiority and economy of power over horse haulage. There have been very many obstacles to overcome, and while at times progress seemed slow, the present universal demand for trucks proves that the educational work was well done after all.

### ON THE FIRING LINE WITH BATTERY BILL.

"On the Firing Line with Battery Bill" is the title of an extremely clever and unique advertising pamphlet published by the Edison Storage Battery Company, Orange, N. J., to bring to the attention of railroad men the quality of Edison batteries. Aside from the very interesting and really valuable information presented, which accomplishes the publisher's main purpose, the book is a refreshing change from ordinary advertising booklets and is sufficiently humorous to compel the attention of every one who receives it.

The city government of Quebec, Canada, has purchased eight Federal trucks for municipal service. The order includes five 3½-ton trucks and three 1½-ton machines. The heavy vehicles will be equipped with sprinklers and the smaller with sweepers.



A Signal Motor Truck, Decorated to Resemble an Armed Armored Battle Car, That Was a Feature of the Automobile Club's "Preparedness" Parade at Seattle, Wash.



**DRAWBAR HAULAGE RATINGS.****SIGNAL-COMMERCE MERGER.****Power Capacities of Tractors To Be Demonstrated at Demonstrations.****Well Known Truck Companies Combine With Thomas Neal as Executive**

The power capacities of the tractors that will be seen at the National Tractor Farming Demonstrations may all be determined by trials equipped with a new device designed by the engineering department of the Hyatt Roller Bearing Company that is known as a hydrostatic dynamometer,—that is, if the manufacturers are at all interested in obtaining a standard for their machines. This will mean a measurement of the drawbar pull in pounds or fractions thereof.

The dynamometer tests are to be made each morning with a 14-inch plow at a given depth, and the results are to be made known to those operating the tractors for judging the number of plows that can be used. Later on comparison may be made between the test figures and the number of plows drawn to determine the actual merit of the work of the machines. The test furrows will also show any difference in the character of the soil that is worked on.

The Hyatt dynamometer has been tested and approved by the United States Department of Agriculture. It consists chiefly of a hydrostatic pressure unit coupled between a tractor and a plow, with a recording gauge that automatically registers the drawbar pull. All the draft being upon the coupling and through the unit, the gauge indicates it.

In the accompanying illustrations are shown examples of the use of the device, the one where a track-laying tractor is hauling a disc plow, and the other affording a better view of the gauges. The dynamometer is not intended for use to officially determine the ratings of the tractors, but is available for all manufacturers who wish to obtain definite information, and seemingly from this opportunity there will be rating that will be generally adopted if not formally approved by the manufacturers and recognized by the industry.

The Signal Motor Truck Company and the Commerce Motor Car Company, both well known manufacturers of Detroit, Mich., have been combined and will be known henceforth as the Signal-Commerce Motor Truck Company. This is one of the most important changes in the Detroit industry in a considerable period and the result is expected to be a very much larger concern that will be particularly active and will be a strong industrial factor with much increased distribution.

The new concern is to have its capital divided into 600,000 shares which will have no established par value, but will be worth approximately \$6,000,000 on the basis of the valuation estimated. The Signal company was capitalized for \$450,000, and the Commerce company for \$250,000, these figures being reached by increases made during the present year. The stock is to be underwritten by 14 members of the Detroit stock exchange.

The Signal company built a series of machines ranging from 1500 to 10,000 pounds capacities, but the Commerce company built a single type. The intention is now to produce machines of sizes that will serve every haulage purpose, and the manufacturing will be in the Signal plant in Commonwealth avenue. Concentration is designed to economize production and selling cost. Thomas Neal, who was head of the Signal company, is chairman of the board of directors. He was formerly president of the General Motors Company, chairman of its board of directors, and is now one of its vice presidents. With him is associated W. E. Parker, president of the Commerce company, who is interested in the Mexican Crude Rubber Company; Myron Neal of the Acme White Lead & Color Works, W. K. Hoagland, T. J. Bosquette and A. H. Buhl.



Tracklayer Tractor Hauling a Disc Plow in California, Showing the Dynamometer in the Coupling.



Tractor Test Made in Wisconsin, Showing the Indicating Instruments of the Dynamometer Held by Observer.

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# The MOTOR TRUCK

*Devoted to Motor Driven Business  
Vehicles of all Classes*

Pawtucket, R.I.

Vol. VII. No. 8.

AUGUST, 1916.

## EDUCATING FARMERS TO TRACTOR ECONOMY.

**Non-Competitive Demonstration Across the Nation from Texas to Wisconsin Proving the Practicality of Tillage by Power and Creating a Demand for Machines That Has Firmly Established the Industry.**

**N**O PROMOTIVE work undertaken by an industry can be compared with that which is interesting hundreds of thousands in the "big farm belt" of the Middle West, which was organized by the Tractor and Thresher Manufacturers' Association, and is being financed by the different concerns active in that organization. The magnitude of this endeavor cannot be paralleled by any promotion engaged in by the automobile vehicle industry, because instead of a single event which was from every point of view competitive, and which would afford to some one or several concerns assumed advantages—which superiority might exist for a very brief period—the tractor builders have co-operated in a series of demonstrations

extending over two months, and which have or are to take place in central locations where they may be easily reached by those operating farms.

Because the manufacturers have co-operated in this promotion there is no aspect of competition. There may be a seeming absence of rivalry, such as might be expected when capacity to a maximum may be desired for a very brief period, and those who anticipate the excitement incident to contests may be-

lieve that the demonstrations are not attractive to the people. If judgment is based on expectation of the work of the tractors measuring up to a sporting standard, the events are disappointing, but those who observe them understand that agricultural work is not in any sense competitive. The work of farming is not a succession of quick and short activities. What is required first of all is endurance to maintain a normal standard of endeavor so long as it may be necessary, and this should be of a character that will be most productive.

The demonstrations were inaugurated at Dallas, Tex., and then in succession were similar events at Hutchinson, Kan.; St. Louis, Mo.; Fremont, Neb.; Cedar Rapids, Ia., and

these will be followed by others at Bloomington, Ill.; Indianapolis, Ind., and Madison, Wis. These are arranged by the tractor demonstrating committee of the association, which organized the details of making entry, demonstrating, transportation, etc., and in each place of demonstration a local committee has charge of all the work essential to making each event a success.

The tractor demonstrating committee planned its



Scene at Fremont, Neb., Smallest City of the National Farm Tractor Demonstration Circuit, Where the Daily Average Attendance Was 20,000 and the Largest Number of Machines Was Shown.



The Farm Tractor Built by Henry Ford & Son, Demonstrated for the First Time at Fremont, Neb., But Not Offered for Sale.

work admirably. Its activities were inaugurated months ago and each local organization was perfected. The tractor and farm implement dealers were organized and each pledged assistance. Systematic publicity was planned, suitable ground for the demonstration was obtained, the different tractor and farm implement manufacturers who might exhibit were communicated with, the merchants were interested in the business opportunities that would obtain from the visits of thousands of people from considerable distances, and the cities were very generally awakened to the desirability of impressing the visitors with the energy and progressiveness of the communities. There was much dependence on the immediate return from the money that would be spent by the visitors, but the business men, and especially those engaged in the sale of agricultural machinery and tools, believed that there would be a continuous practical benefit from the better cultivation of the land and the production of increased crops.

The purpose of these local committees was without exception to make the demonstrations of tractors occasions that would at least equal state fairs in importance, but they could not have the attractiveness of such events with prize competitions generally open to individuals, and as a rule they would have attraction during the daylight hours. This condition necessitated the arrangement of other forms of entertainment that would appeal to those who sought pleasure, and where the committees could do so they planned meetings that were addressed by practical and scientific agriculturists, who discussed the application of machinery to farming operations and the better results obtained from the use of specially

adapted tools. These were intended to interest the farmers in their own welfare—to impress upon them the fact that they could profit by systematic organization and application.

The executive committee of the association co-operated with the local committees in this educational work and assisted them so far as was possible. The direction of the demonstrations was placed in charge of a representative of the association, who served with the head of each local committee in managing them, and who saw that there was no spirit of competition injected into the exhibitions. There may be inquiry

as to the reason why the association was so positive in its determination to avoid competitive events, and the best answer that can be made is to state that the normal capacities of the machines range from hauling two to 28 plows, and with this variance and cultivating expense being the actual determining factor, comparisons could not be made without precise knowledge of the work done in each instance. And even then such a comparison might not be just.

#### Demonstrations Open to All.

The general policy of the National Farm Tractor Demonstrations is for each to be open to all who desire to take part, entering as many machines as might be desirable, and requiring that each machine work on the same area of ground and continue until the entire area was worked over. The tractor of large capacity would do a given work in less time than another of smaller rating, but every observer would know what each machine could do and from his observation, and knowledge of his own work, determine what type



Testing the Drawbar Pull Necessary in a Soil with the Hyatt Dynamometer Coupled Between a Standard-Detroit Tractor and a Gang Plow.

would best serve him. There were public demonstrations at stated times, when all of the tractors were worked at once, so that any individual could see those in which he was directly interested, and at other times the tractors were worked in what were known as private exhibitions, for the benefit of those who desired more specific information than was obtainable during the regular work.

There was another aspect of the private exhibitions, and that was the opportunity for teaching those who had purchased the practical operation of the machines, so that they need not experiment with them. Many thousand farmers own automobiles and have some knowledge of machinery in a general way, but with rare exceptions they are not familiar with tractors, and even with the best of care will meet with conditions that will cause delay and perhaps loss of service unless they have more knowledge than would be obtainable from reading instruction books or from casual observation. While one's experience cannot be

tanks be filled from the same sources of supply, so that there could be claim of special quality with reference to any machine, and the observers could be assured that they could obtain the same grade in the market.

Some of the tractors shown are designed for burning gasoline, some kerosene and a few distillate. Generally speaking there are more gasoline tractors than any other, and some are regarded by the makers as affording satisfactory service with either fuel. The cost of fuel is an important item of operating expense and beside this the matter of insurance is of considerable importance, for there is assumedly less danger from

fire with kerosene tractors than with other types. Kerosene is very generally used on farms for lighting and in many instances for fuel, and because it is not regarded as inflammable, or as inflammable as gasoline, no special provision for storage is required by insurance companies. There is but little shrinkage from handling or evaporation and from an all-round viewpoint has much to recommend it, although it may not

have equal fuel efficiency and a kerosene tractor needs more engine attention. The same statement can be applied to distillate, but this is not as frequently used as kerosene, probably it is not known, although some extremely satisfactory results were obtained with it. Distillate is used much more generally in California, where it is utilized by those who operate stationary engines, tractors and trucks, and it has been proven to be a very economical fuel and there is much to be said regarding it that is favorable.

The opening of the series of demonstrations at Dal-



An Avery Tractor Being Demonstrated with a Series of Binding Machines at Fremont, Neb., to Show the Utility of the Machine.



The Spectacular Feature: A Holt 80 Horsepower Caterpillar Tractor Plowing a Furrow 20 Feet Wide at Dallas with a Gang of Four Saunders Seven-Disc Plows, or 28 Plowing Discs.

too broad to obtain the best of service, there is no doubt that a man who will work for a comparatively short time under the direction of an expert will learn what will decidedly benefit him.

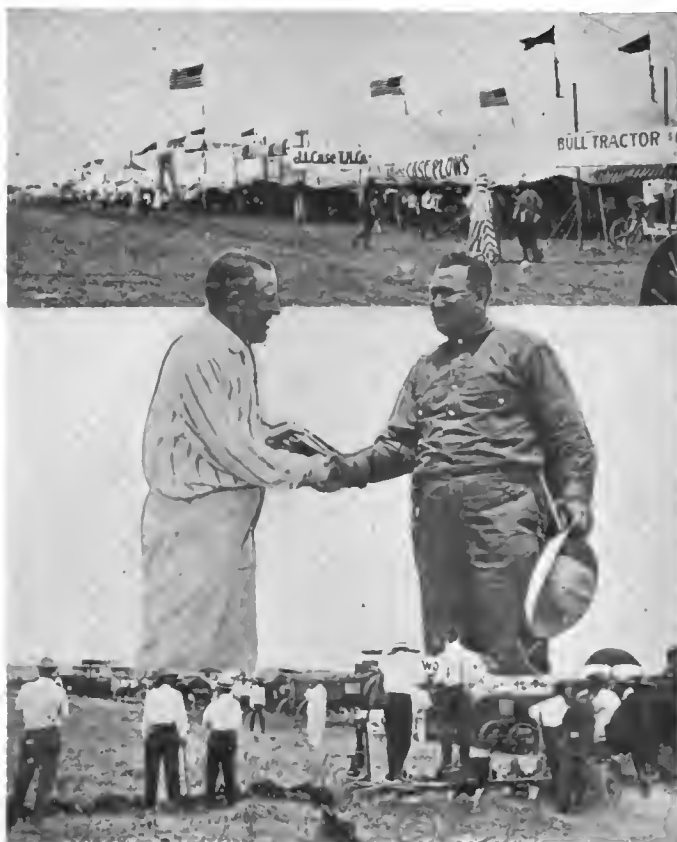
#### Results with Different Fuels.

For the observer concerned in tractor operation there was nothing more interesting than the results obtained with different fuels. There were no limitations as to what would be used, either gasoline, kerosene or distillate—the tractor manufacturer had his choice, the only requirement being that all tractor fuel



A Size for Every Work: A Display of Avery Tractors, Using Either Gasoline or Kerosene, Shown After the Plowing Demonstration at Dallas, Tex.





**Incidents of the Demonstration Circuit:** At Top, the Tents of the Exhibitors; in Centre, Local Manager LaMonte Daniels of the International Harvester Company and General Manager A. E. Hildebrand Congratulating Each Other; at Bottom, the Tractors Working in the Field at the Close of the Last Day.

las was extremely gratifying to the committee of the association and to the local organization, for despite the unusual conditions prevailing in the Lone Star state the attendance was very large. Statement is made that more than 100,000 visitors were directly attracted to the city, which is the largest in Texas, and the machines were shown operating on a 1200-acre farm within a short distance and easily accessible. The committee that organized the event has left nothing undone and the splendid support of the industry was manifested by displays by 29 different manufacturers, who showed from one to a half dozen machines, and

in addition practically every large concern producing farm implements was represented by every machine intended for agricultural work.

While one may assume that with 140 manufacturers of tractors in the United States the number of exhibitors was not representative, but one should remember that the scene was the extreme southwest and that with few exceptions all of the builders are located in Ohio, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri and California, and material expense was entailed by taking crews of men from the factories and demonstrating them. There were no exhibitors from west of the Rocky mountains, and practically all of the machines were shipped long distances at large expense. While nearly all of the manufacturers were represented by agencies or branches, there was every reason for personal representation by sales and advertising managers, by officials and engineers, for hundreds of inquirers must be seen and plans made for meeting the demand for production that the demonstrations were expected to create.

#### **Soil Conditions Not Favorable.**

The soil conditions were not especially favorable, for the season was far advanced and the ground could not be as easily cultivated as earlier in the year, but these were as fair for one exhibitor as another and as there were no competitions the trials were more nearly like what might be expected on a farm that was economically and well cultivated. The character of work ranged from plowing with two to 10 plow bottoms and the use of varying other machines.

The exhibition that was the most impressive was made with a Holt 90 horsepower Caterpillar tractor that drew four Saunders seven-bottom gang plows, cutting a furrow 20 feet wide and turning the soil perfectly, although statement is made that the black land was baked very hard. In addition to the moldboard and disc plowing, the spectators saw practical work with pulverizers, cultivators, harrows, reapers, binders and road building machinery. That the tractor exhibitors might have accurate knowledge of the soil conditions furrows were plowed each morning with a



machine that was coupled with a dynamometer, and with this as a gauge of the drawbar pull required for a plow each worked with the number of plows that could be hauled with certainty.

There were two classes of buyers noticeable at the demonstration—the implement or motor vehicle dealer who wanted to make agency contracts, and the farmer who is desirous of purchasing what will best serve him in cultivating his property. There were surprisingly large numbers of each class and sales managers without exception stated that the demonstrations were productive quite beyond belief. Much care was taken to advise the individual buyers, because there was realization that much depends upon the results obtained by the owners, and the market of the future will reflect very largely the judgment of the salesmen. By this is meant that a man's requirements were very carefully considered before any type was recommended to him, so that he was guarded so far as possible against probable errors of judgment and he would have what would be an economical and profitable machine. Those who have accurately estimated the results of the demonstration in Texas say that the market for the coming year in that state alone will take thousands of tractors of all types.

#### **Kansans Very Enthusiastic.**

When the demonstration at Dallas was concluded the exhibitors loaded their machines on special trains and started for Hutchinson, Kan., where the second event of the series took place. Hutchinson is a much smaller city, but it is the centre of a large zone of agricultural Kansas and Oklahoma, and this attracted many thousands of visitors. There were 38 different exhibitors of machines, and though the soil conditions were by no means what they would be earlier in the season, the results were highly satisfactory from every point of view. If Texas farmers were enthusiastic of tractors the Kansas and Oklahoma observers were at least equally interested, and there was very large buying and a demand for agencies that was quite beyond expectations.

#### **Large Attendance at St. Louis.**

The third demonstration was at St. Louis, Mo., where 31 manufacturers made exhibits, and though this was close to a very large city, during a period of extremely hot weather and during the height of political primaries throughout the state, there was an attendance estimated to include at least 100,000 persons interested in farming, and there was an unprecedented number of inquirers for agencies, as well as seemingly unlimited buyers. The crews handling the machines were generally augmented at St. Louis, for two weeks' hard campaigning and exceptional activity had its effects upon the men, and each manufacturer wanted to make the most of the opportunities for sales and agencies.

#### **Fourth Demonstration at Fremont.**

The next jump was to Fremont, Neb., the smallest city of the circuit, but which is a commercial centre of considerable importance, and even there the visitors

to the demonstration grounds numbered in excess of 20,000 daily. The number of exhibitors taking part was 42, this being the largest participating in any one event up to that time, and of them 19 had machines at all four demonstrations. Included in this total was Henry Ford & Son, which showed three tractors that haul two plows in normal work and which will, according to statement, be sold for an extremely small price. No market value was placed on the tractors, however. The machines are light, are said to be economical of fuel and lubricant, and there is reason to believe that these will be produced in large numbers and by methods that are characteristic of Ford production.

Mr. Ford and his entourage came from Detroit in a special train, accompanied by an Hawaiian orchestra, and considerable entertainment was afforded by the combination of tractors and musicians. The Fremont citizens were extremely hospitable and they did wonders considering the size of their city, and the advent of the Ford train and its numerous attractions compensated for whatever may have been lacking in the way of social amusement. The Ford machine was examined by thousands and was one of the centres of interest, and the refusal to market it was a disappointment to many who sought agencies and individual purchases.

#### **Future Market Appears Unlimited.**

The result of the Fremont demonstration was fully as satisfactory from the viewpoint of the exhibitors as those in the other cities, and some of them stated that if they were justified in basing opinion upon expressions of farmers there was every reason to believe that the manufacturers would be unable to supply the demand for machines without large increases of their production facilities. The work of the demonstrating crews was strenuous enough, and in many instances the men had been so busy that they had not even time to make direct report to the main offices, leaving communication to the sales managers or others who would return to the factories and could give from personal knowledge or observation detailed information relative to the marketing possibilities.

#### **Four Demonstrations Yet to Be Made.**

With the conclusion of the Fremont demonstration the tractors were again shipped to Cedar Rapids, Ia., and then in turn the demonstrations will be at Bloomington, Ill.; Indianapolis, Ind., and Madison, Wis., where the circuit will be concluded Sept. 8. The sales managers of the exhibiting company have been besieged with managers of agricultural fairs, who wish to have tractor shows as features, but with rare exceptions these have been turned over to the representatives of the companies to make such plans as may be practical for them. There is one conclusion, however, that can be depended upon, and that is there will be another series of demonstrations next year, and the circuit will be equally as large, but probably in another section of the country. The tractor manufacturers will spend this year for the education of the

people not far from a half million dollars, but it will be the best investment that they ever made, and it will establish the industry upon a basis that will be absolutely sound and certain.

The following tabulation shows the different concerns that have participated in the different demonstrations at Dallas, Tex.; Hutchinson, Kan.; St. Louis, Mo., and Fremont, Neb., or half of the series. The table indicates that in all 50 manufacturers have been represented at one or more of these, 38 at two, 31 at three and 19 at four:

Make	Maker	Dal.	Hut.	St.L.	Fre.
Rumely (3)	Advance-Rumely Co.	1	1	1	1
Albaugh-Dover	Albaugh-Dover Co.	1	1	1	1
Allis-Chalmers	Allis-Chalmers Mfg. Co.	1	1	1	1
Aultman & Taylor	Aultman & Taylor Mch. Co.	1	1	1	1
Louisville Motor Plow	B. F. Avery & Sons, Inc.	1	1	1	1
Avery	Avery Co.	1	1	1	1
Capital	Bates Tractor Co.	1	1	1	1
Buckeye	Buckeye Mfg. Co.	1	1	1	1
Blg Bull	Bull Tractor Co.	1	1	1	1
Creeping Grip	Bullock Tractor Co.	1	1	1	1
Case	J. I. Case T. M. Co.	1	1	1	1
Corn Belt	Corn Belt Tractor Co.	1	1	1	1
C. O. D.	C. O. D. Tractor Co.	1	1	1	1
Leader	Dayton-Dick Co.	1	1	1	1
Sandusky	Dauch Mfg. Co.	1	1	1	1
Denning	Denning Tractor Co.	1	1	1	1
Allwork	Electric Wheel Co.	1	1	1	1
Emerson-Big Four	Emerson-Brantingham Im. Co.	1	1	1	1
Ford	Ford Tractor Co.	1	1	1	1
	Henry Ford & Son.	1	1	1	1
Gray	Gray Tractor Co.	1	1	1	1
Happy Farmer	Happy Farmer Tractor Co.	1	1	1	1
Hart-Parr (4)	Hart-Parr Co.	1	1	1	1
Hoke	Hoke Mfg. Co.	1	1	1	1
Caterpillar	Holt Mfg. Co.	1	1	1	1
Huber	Huber Mfg. Co.	1	1	1	1
Mogul-Titan (2)	International Harvester Co.	1	1	1	1
Bate's Steel Mule	Joliet Oil Tractor Co.	1	1	1	1
K. C. Prairie Dog	Kansas City Hay Press Co.	1	1	1	1
Strait	Killen-Strait Mfg. Co.	1	1	1	1
Kinnard-Flour City (2)	Kinnard-Haines Co.	1	1	1	1
Farmer Boy	McIntyre Mfg. Co.	1	1	1	1
Twin City	Minneapolis S. & M. Co.	1	1	1	1
Moline-Universal	Moline Plow Co.	1	1	1	1
Nilson	Nilson Farm Machine Co.	1	1	1	1
Parrett	Parrett Tractor Co.	1	1	1	1
Peoria	Peoria Tractor Co., Inc.	1	1	1	1
Pioneer	Pioneer Tractor Mfg. Co.	1	1	1	1
Helder	Rock Island Plow Co.	1	1	1	1
Russell	Russell & Co.	1	1	1	1
Simplex	Simplex Tractor Co.	1	1	1	1
Standard-Detroit	Standard-Detroit Tract. Co.	1	1	1	1
Sweeney's Iron Horse	Sweeney Tractor Co.	1	1	1	1
Standard	Standard Tractor Co.	1	1	1	1
Walte	Walte Tractor Sales Co.	1	1	1	1
Wallis Cub	Wallis Tractor Co.	1	1	1	1
Ward	Ward Tractor Co.	1	1	1	1
Waterloo Boy	Waterloo Gas Engine Co.	1	1	1	1
Western	Western Tractor Co.	1	1	1	1
Wolverine	Wolverine Car & Tractor Co.	1	1	1	1
Total at one Demonstration		29	38	31	42

#### NEW YORK AGENCY FOR D-E TRUCKS.

The Gramm Company, Inc., at 1457 Broadway, New York City, has become eastern distributor for the D-E motor trucks, manufactured by the Day-Elder Motors Company of Newark, N. J. The Gramm Company, which at present is distributor for Gramm-Bernstein heavy trucks, will have a selling field for the D-E machines comprising New York City, Long Island and lower New York state as far as Albany, the State of Connecticut and Northern and Eastern New Jersey, with the exception of Union and Essex counties.

The Day-Elder Company has also closed a contract with H. H. Hay of Baltimore, Md., giving the latter the agency rights in the states of Maryland and Delaware and the District of Columbia.

## TRUCK ECONOMY ON HILLS.

### Haulage by Motor Vehicle Shows Big Saving in San Francisco.

Although an 18 per cent. grade is considered the greatest on which animal haulage can be practically used, there are numerous grades in San Francisco, Cal., of from 25 to 35 per cent. which are open to traffic. Before the use of motor vehicles, engineers believed that these streets would never be used by vehicular traffic. Now, however, trucks and motor cars are travelling them. A horse could scarcely be expected to haul an empty wagon on a dry pavement up a grade so steep.

In San Francisco apartment houses face the steepest grades. Deliveries are made by horse drawn vehicles by leaving the horses at the bases of the hills and by the drivers carrying the goods to the houses, or else a circuitous route must be taken to drive nearer, which requires much time.

Steel shod wheels offer little braking resistance on the smooth pavements and the only way wagons can be held in descending is to allow them to skid against the curb and scrape along it.

The contract price of a team of horses in San Francisco for a day, making a mileage of about 18, is \$8. The average speed of such a team is three miles an hour. It would require three teams at \$24 to equal a Garford truck with a mileage of 40 per day. Garford trucks used in this service cost \$12.24 per day. This results in a balance of \$11.76 a day in operating expense in

favor of the truck, or \$3522 for a year of 300 working days. A truck can be housed in much smaller space than horses and wagons, the ratio being about 7½ to one, so that a great saving in rent is made. These conditions are true in some degree in every hilly city.

A new alcohol of high specific gravity is said to have been discovered in Germany which produces a motor fuel suitable for use in ordinary motors with slight carburetor adjustments, when mixed in proportions of from four to six of alcohol to one of gasoline or benzol. There is a firm in Germany which is said to have capacity to produce 120,000,000 gallons a year of this fuel, which is enough to serve the entire requirements of the country for motor use at this time.

**F. J. ALVIN JOINS U. S. MOTOR.**

Forest J. Alvin has become general sales manager of the United States Motor Truck Company at Covington, Ky. Until the recent purchase of the New Era



F. J. Alvin, Sales Manager of the United States Motor Truck Company.

Engineering Company, Joliet, Ill., by the Elgin Motor Car Corporation, Mr. Alvin was president and general manager of the New Era company.

He is one of the pioneers in the motor car industry, being active in that field since the late '90s. Twelve years ago he was president of the Auto Trade Credit Association in New York City and also president of the New York Export and Import Club.

In addition to his general sales experience, Mr. Alvin is recognized as an astute purchaser of materials and parts and is considered one of the leading production men in this country. Mr. Alvin assumed his duties with the United States Motor Truck Company Aug. 15.

**MOTOR TRUCKS IN AUSTRIA.**

Several large concerns in Austria are planning to manufacture heavy motor trucks, as the machines have been subjected to extreme tests in army service during the war and have proven to have great serviceability. Two concerns that are making ready to take manufacturing when the war is over, are the Skoda-werke A. G. of Pilsen and the Waffenfabrik at Steyr. When starting these companies will require machinery and machine tools with which to equip their factories.

**NEW TORBENSEN FACTORY.**

The Torbensen Gear and Axle Company, Cleveland, O., manufacturer of the Torbensen drive internal gear axle for commercial vehicles, has completed a new factory, which affords it 50,000 square feet of manufacturing space. The concern has also purchased four acres of land located on E. 152nd street, in Cleveland, which will be used for future expansion.

**ADVOCATE REGULATION OF TIRE WIDTHS.**

Street paving experts have suggested to the city government of Boston that the ordinances regulating vehicular traffic in that city should stipulate and define the width of tires for trucks proportionately to the weight they are to carry. The rules and regulations in Boston governing vehicular traffic already stipulate maximum measurements for the length and width of vehicles and a maximum load limit.

While the board of street commissioners there seem to be of the opinion that there is no necessity of regulating the size of tires, as the truck manufacturers have equipped their machines with tires of ample size to carry capacity loads, truck engineers having abandoned the narrow tires, as these wore very quickly and did not protect the mechanisms of the vehicles.

The street experts on the other hand say that a motor truck designed to carry a load of six tons should have tires not less than six inches in width, particularly where it is to be used over asphalt pavements.

**H. T. BOULDEN TO JOIN SELDEN.**

Hal T. Boulden on Sept. 1 will sever his association with the Chase Motor Truck Company, Syracuse, N. Y., for which he has been serving as general sales manager and associate executive in charge of sales and advertising, to become sales director of the Selden Truck Sales Company of Rochester, N. Y.

Mr. Boulden's work with the Chase company has made him known widely throughout the industry and has prepared him to take up the progressive sales campaign which the Selden contemplates inaugurating on Sept. 1. Before joining the Chase organization he had varied experience in the industry. He was once general manager and vice president of the Service Truck Recorder Company of Cleveland, O.

Mr. Boulden will be succeeded in the Chase company by B. E. Blackley, who for some time past has been acting as his assistant. R. H. Salmons, who has been active in the sales work in the Selden organization, will continue as secretary and will also look after the details of the export business, which has grown to large proportions during the past year.



Hal T. Boulden, New Sales Director of Selden Truck Sales Company.

## INTER-FACTORY TRACTOR.

### Thread Manufacturer Adopts Unusual Vehicle in Service About Mills.

The J. & P. Coats Thread Company, which is the largest thread manufacturer in the world, operating mills in Central Falls, R. I., and Newark, N. J., and in



The Coats Thread Company's Tractor and "Low Gear" Chassis Without Body, the First Machine of the Kind Ever Developed for Heavy Haulage.

Scotland, has placed in service at its Central Falls plant a vehicle that is unusual, as its use is unique, and which is expected to be a large economy. The product of the company is sewing thread and this is produced from the bale cotton, going through numerous processes to make it ready for shipping to its sales rooms and agents.

The plant is a considerable number of buildings on a 52-acre tract of land and as the manufacturing cannot be carried on under one roof in the course of making, the partially finished material is carried from one building to another. Until the present month animal wagons were used, and according to the company's engineers there is a route of about a mile to be covered in serving the different departments.

The material is placed on trucks in the different departments and wheeled about, but to haul it from the one building to another necessitated unloading and reloading on animal trucks, and unloading and reloading on the mill trucks where delivered. The idea of transporting the mill trucks from the one building to the other was regarded as practical.

To obtain a vehicle that would be so low that the mill trucks could be loaded readily and quickly was a problem that was solved by an equipment built by the American

and British Manufacturing Company, Providence, consisting of a gasoline electric tractor and coupled to this by a gooseneck or yoke a trailer that is suspended on semi-elliptic springs mounted above the low rear axle. This is an adaptation of a type of dray known in Rhode Island as a "low gear," and which name is given by the manufacturer to this machine.

On the chassis or trailer frame is a body with a platform 198 inches long and 72 inches wide, with heavy internal panelling and a standing roof that is 78 inches above the deck. The frame on the body is covered with water proof fabric. The rating of the tractor is three tons, but the 40 horsepower gasoline engine and the electric motors driven from the generator insure much greater capacity. The tractor and trailer are fitted with 48-inch wheels and solid rubber tires. The machine is now in service, replacing two horse teams (four animals), but because of the handling of the loaded mill trucks in it the service of six men was dispensed with. The tractor is expected to be extremely economical.

### THREE ADDITIONS TO SPRING PLANTS.

The Western Spring and Axle Company is making substantial additions to its three plants. A large, new building is being built at the Hess Spring and Axle Company plant in Cincinnati, and at the J. B. Armstrong Manufacturing Company of Flint, Mich., a new building is being erected for heating and treating and fitting departments. A large addition for stock room and finishing department is being built at the Cleveland-Canton Spring Company's plant at Canton, O.



American and British Tractor and "Low Gear" Trailer Adopted for Inter-Factory Transportation by J. & P. Coats Thread Company, Central Falls, R. I.



## PRACTICAL CONTRACT HAULAGE EFFICIENCY.

**How C. P. Ralli, Inc., a Brooklyn, N. Y., Concern, Converted Its Equipment and Developed Business as a "Specialist in Trucking" in a Very Brief Period.**

**C**ONTRACT haulage is a business very generally engaged in the nation over, but concerns that are successful in this work are usually long established, well known in the communities in which they operate, and have large investments in equipment. These firms undertake to afford special service for those who have need for highway transportation, supplying whatever may be necessary in excess of facilities ordinarily available, or serving those whose requirements are not sufficiently constant to justify maintenance of departments to do this work.

The disposition of those who from time to time have idle equipment to accept work cheaply between periods of full activity, and the large number of that

sults in all operating conditions.

The larger the community the stronger the competition and, seemingly, the less the possibilities for success, and yet in New York City, where these factors may be found to perhaps a greater degree than elsewhere, the experience of C. P. Ralli, president of C. P. Ralli, Inc., will demonstrate that business men are quick to recognize high grade service and that practical methods will insure productive operations, even on a comparatively small scale.

### **Company a "Specialist in Trucking."**

The business, as the name implies, is conducted by a corporation, of which Mr. Ralli is the executive, and it was established by Mr. Ralli in May, 1914. The



**Five of the Garford Trucks of C. P. Ralli, Inc., "Specialist in Trucking," Ready to Leave the Bush Terminal Warehouse for the First Trip of the Day.**

class that engage in haulage "jobbing," precludes anything like standard prices for service, although concerns of proportions prefer to deal with responsible men, who can fulfill any work they engage to do and handle freights without losses or damage and can be depended upon.

### **Large Concerns Given Preference.**

Because of this competition with reference to price for work the contracts that may be regarded as productive are obtained by the larger and well known contractors, and those who have limited equipment and comparatively few customers develop slowly as a rule, from the fact that a definite return on the capital invested is rarely if ever certain. Not only this, the service that will insure satisfaction can only be given with vehicles and an organization that will insure re-

success that has been attained is due to two factors, the technical education of Mr. Ralli and his application of scientific methods to his business, because until he engaged in it Mr. Ralli had no knowledge whatever of trucking or transportation methods. One may assume that to compete with large and well established concerns was a man-sized contract, and when one realizes that he was unknown and had to gain recognition by the character of service, and that he was further handicapped by lack of capital, the prospect for success would appear to be extremely discouraging.

The development has not been of a mushroom character, although it has been rapid as compared with the progress made by similar concerns, and, moreover, the business has been established on a foundation that is absolutely sound. Mr. Ralli may not

be the only haulage contractor in America who has carefully systematized and organized his work, but his company is the only one that has established itself as "specialists in trucking," and because of this title has undertaken to give to its customers better service than can be obtained from other concerns that are competing with it for work.

#### **Company Is Operated Efficiently.**

The company has today equipment that is not necessarily superior to that operated by other companies, but it is operated with a view to obtaining high efficiency and the greatest economy of time, and Mr. Ralli has not hesitated to adopt methods that are revolutionary as contrasted with those the vogue with competitors and which have been exceptionally productive.

Mr. Ralli obtained a technical education and after graduation was employed as an engineer and still later was engaged in manufacturing a chemical preparation. The future possibilities were not especially attractive, but he might have continued had he not become convinced that to maintain his health he had

ing because of congestion in the streets and about the loading and receiving platforms of warehouses. Time was lost in waiting for shipping clerks to collect loads and there was always a rush in the afternoon to make up what had been lost earlier in the day from varying causes.

Another condition was that in many of the warehouses the elevators could be used only by one concern at a time and there were often a number of trucks waiting for loads that could only be taken on at one point of delivery. Mr. Ralli found that a very large part of the railroad shipments which are received at the Bush terminal were stored in the warehouses to await delivery, and many of the concerns manufacturing in Brooklyn made deliveries to these warehouses. To be close to the warehouses was desirable, if not necessary, and so he rented a small office at the Bush terminal and installed a telephone and employed a clerk to keep his records and receive orders. He planned that there would be definite statement made to every inquiry relative to service during business hours, and that there should be no question as to his dependability.

Mr. Ralli's technical education had taught him the necessity of system and organization, both with reference to service and to accounting, and when he opened his books he realized that he could not obtain efficiency or economy unless he knew what work had been done and the cost of doing it, and then devoted himself to economizing so that there would be as large a profit as was possible. Accurate records which would show every detail, and which from the operating viewpoint should be as



**Loading One of the Ralli Trucks at the Bush Terminal—A Clear Platform and Free Elevator Means Much Time Economy.**

best work in the open air. Having decided to do this, and not having resources or experience that would justify him taking up construction, he cast about to find what he could undertake with small investment and reasonable assurance of developing a permanent business.

#### **Studied the Local Conditions.**

He studied the conditions obtaining with highway transportation in Brooklyn and decided that he would take up contract haulage, after he had solicited the work of several concerns and been informed that he would be given consideration if his prices and his service were equal to those of other contractors. Mr. Ralli then purchased six horses and three two-horse trucks and started in business May 5, 1914. He found the work hard and competition keen and as he drove one of the trucks he soon learned from experience the conditions that cause loss of time and limit speed. He noted that the time usually allowed by customers for delivery from stores to terminals was seldom adequate, which was due to delaying haulage until the last moment, and there were generally delays in load-

simple as possible and yet contain every essential fact, were necessary.

Instead of assuming figures, or accepting what was customary with others in the same business as basic, Mr. Ralli first determined his overhead expense, then his operating cost, and based his prices for service on these with a reasonable margin of profit. While price might be said to be the conclusive factor with practically all concerns with whom he did business, the manner of doing the work, the time required and the care taken were also of importance.

#### **Made the Most of Opportunities.**

Mr. Ralli employed two drivers and three helpers when he began business, and later on, as work increased, another team of horses and another truck was placed in service. The purpose was to become as widely known as was practical, to establish a reputation for high grade service, and to obtain reasonable profits through efficiency and economy. He had the same equipment and opportunities as hundreds of others engaged in haulage, and development could only come through serving his customers bet-

ter than other contractors could serve them.

He did much haulage to and from the Bush Terminal buildings, and he sought to make arrangements that would minimize loading time, for where a stated price a case or package or a tonnage rate was paid time economy was his gain. This is the usual manner of contracting for haulage, hour rates ordinarily applying to work done in uncertain conditions. By having understandings as to collection of loads in the warehouses, the use of elevators, the assistance of warehouse clerks and places at the receiving and delivery platforms, material savings were possible, although even under the most favorable conditions there is considerable loss that otherwise might be saved to the customers.

#### **Bought His First Motor Truck.**

The reputation of the "specialist in trucking" was so well established that in the winter of 1914-15 Mr. Ralli studied the possibilities with machines and decided to purchase a 1500-pound Garford machine, which was ordered in March, 1915, and another of 3000-pound capacity. These were used with the horse trucks and were found to be extremely serviceable. The operating plan was to use these for quick light haulage and for making long hauls, carrying loads which would not be profitable for horse trucks, because of the small weight or bulk or the distance of transportation, using the teams for work between the warehouses and the different manufactories and the piers.

But the experience was that the load capacities of the 1500-pound machine was too small and that larger vehicles were required to insure a satisfactory profit.

That is, the cost of operating was too great when measured by the earnings of the truck in the work usually done with it, while the expense of machines double the size would be comparatively small increase and the earning power would be double. This conclusion led to the exchange of this machine for a Garford truck of 3000 pounds capacity, which was found to be exceedingly satisfactory.

#### **Motorization Followed Quickly.**

Nov. 22, 1915, a second 3000-pound Garford truck was ordered, this having a body with loading platform 12 feet long. This was used with the other truck and the horse trucks. Meantime, Mr. Ralli had determined that the possibilities of the business were such as to justify engaging in it on a large scale. He interested capital and organized a company that is known as C. P. Ralli, Inc., and disposed of all his horses, replacing the teams and trucks with two three-ton Garford trucks, this giving him an equipment of five machines.

These trucks were delivered early in March, and that same month a two-ton Garford truck was ordered and delivered, making six trucks that were available. The company is now operating these, with a probability of another increase within a comparatively short time.

Minimum expense was necessary for development and instead of maintaining a garage the machines are kept at the Commercial Garage at Third avenue and Sixth street, and a mechanic does whatever work is needed to keep them operative. This man does the greater part of his work at night and Sundays, having such assistance as may be required should the repair or adjustment be more than can be accomplished in the time available without encroaching upon working hours. When the equipment is increased the purpose is to rent or build a garage and equip it so that all of the necessary work can be done without sending the trucks to the service station for overhauling, which is the present policy.

Mr. Ralli has been extremely careful in the selec-



One of the Ralli Trucks Decorated for a Demonstration and Distribution of a Well Known Confectioner's Product.

tion of his drivers, hiring the best men he can and paying them good wages, and he has established a plan of paying each driver a bonus proportionate to the economy obtained from his use of his truck. This applied to saving of the time of the truck and the cost of operating it, so that the men are encouraged to drive carefully, save fuel and lubricant, make adjustments whenever necessary on the road, and to load and unload quickly. By observing the condition of the trucks and having timely repairs made they are almost constantly operative and delays are infrequent. The men are expected to select the routes that are best so far as street paving is concerned, to avoid overloading, to drive discreetly, and they are paid for the care they exercise. This plan has been exceedingly satisfactory so far as work and operating cost is concerned, and the drivers are as interested in their work as though they own the machines.

Instead of the men giving so much time a day to

their work they are endeavoring to do all they can and do it cheaply, insuring to the company exceptional efficiency and a character of service that satisfies the customers, and the more they can save for the company the more they themselves profit. From one point of view the men are managers or partners, and the capacity of each is recognized to the full value of the work done without reference to anything else than is shown by efficiency and operating record.

#### The System for Operating.

The drivers report at the garage for their trucks at seven each morning and are expected to be ready for work at the places of business of the customers at 7:30. Each keeps a time card record, which accounts for the time for each trip made, the number of pieces handled, the number of loads carried, the value of the

delivered to the driver, and the oil is supplied at the office, a sufficient volume being used to fill the lubricant tank. From the time cards of the drivers the charges are made up for the bills, unless collections have been made by the drivers, so that the cards serve more than one purpose. From these as well the tire records are made. The prices established for the customers are usually standard for varying service, and these are noted from a card system, so that the charges cannot be confused, and on the cards are noted the value of the work done, or the earning of each machine for any given date.

#### Record Made up Each Day.

The operating record of the truck is made up daily and this includes overhead cost, operating expense, repairs and wages, carried in four columns and totaled at the bottom of each page. The regular accounts are in double entry and show either a credit or a debit balance whenever footed. The record of the tires is carried in a separate book, the mileage being charged against the guarantee and the excess of the deficiency being shown as a profit or a loss, or balanced with an adjustment and a profit and loss charge.

The investment in the business is considerable, because of the machines, but aside from this expenses are kept very low. A small runabout is used by Mr. Ralli to make soliciting and collecting calls and to supervise the work of the men, and it is also serviceable to reach a machine that may be stalled, for the mechanic and such tools and parts as are necessary can be hurried to a truck should there be need. The cost of this machine is not charged against the trucks, save in the event of some unusual circumstance, but it is regarded as a necessary part of the business and generally it is provided for so far as expense is concerned in the overhead of the enterprise and is not in the overhead cost of the trucks themselves.

The service from the viewpoint of the customers is better because it is faster, the charge for a given time is less, the work is well done and the men are anxious to show efficiency, and because of their very evident purpose to save time they have materially improved the loading and unloading conditions with a number of customers. There is endeavor to impress upon all customers that the burden of delays fall upon them in the form of direct charges, and they are usually willing to co-operate so far as possible when the saving is to be a substantial benefit to them.

Scientific trucking appears to be a very simple matter, and so it is, for it simply means the use of common sense in methods and so far as possible reducing loss and unproductiveness, for the more the machines are moving the greater will be the daily return. The progressiveness of Mr. Ralli in advertising his company as a "specialist in trucking" may be regarded by some as more fanciful than productive of results, but the very evident saving and the better service has steadily attracted customers and developed a business that has become especially prosperous in a comparatively short time.

Truck No.....	Date.....
Chauffeur .....	
Report at.....	Time.....
1st Trip—L'd.....	Stops..... Back.....
2nd " " .....	" " " .....
3rd " " .....	" " " .....
4th " " .....	" " " .....
5th " " .....	" " " .....
6th " " .....	" " " .....
Pieces handled.....	No. of St. Lds.....
Value of Work done.....	Expense.....
Day's Mileage.....	Gas..... Oil.....
Odometer reading.....	
Mechanic's Report on Work done.....	

The Driver's Time and Record Card of C. P. Ralli, Inc., from Which the Work, Time and Operating Cost Is Entered and the Customer's Bill Filled.

work done, the expense (ferriage, tolls, telephone calls, or similar items and lunch if necessary), the day's mileage, the gasoline and oil consumption, the odometer reading and any special detail. These cards are filled by the drivers during the day and are turned into the mechanic at the garage with any report of work necessary, and the cards, with the statement of the mechanic relative to any repairs made indorsed thereon, are collected by Mr. Ralli and taken to the office each morning.

Each driver fills the fuel tank of his truck at the garage and the fuel slip is signed by the mechanic, he certifying that a given quantity of gasoline has been

**ALCO MAKES BIG PROFIT.**

The American Locomotive Company, which built Alco trucks and cars up to 1914, made a net profit last year of \$10,769,000, wiping out the deficit of \$1,500,000 which existed at the end of the fiscal year in 1915. The company ceased building automobiles in 1913 and confined its operations to building locomotives until the European war broke out, when it received some enormously large war orders, which accounted for the abnormal profits during the past year.

**PIERCE-ARROW CUTS LABOR COSTS.**

The C. H. Evans & Sons, New York City brewers, has a five-ton Pierce-Arrow truck which displaces three two-horse teams, which could not deliver as much in a day as is delivered with the truck. As an economical proposition, the concern's books show decidedly in the favor of the truck. The three horse teams cost \$22.86 to operate each day, while the motor truck costs less than \$18 daily. The Evans company's books show the keep of each horse to be \$36 a month, including shoeing, making \$216 a month for six horses. A driver and helper for each team totals \$396 per month, making the total outlay for the three teams \$612 per month, or \$22.86 per day for the horse delivery outfit.

These figures do not allow for the possible death of one of the horses or depreciation of wagons or equipment, while in charging \$18 a day for cost of operating the truck every item has been taken into account, including depreciation, interest, insurance, gasoline, oil, tires, repairs, garage charges, wages, etc. The change is also welcomed by the firm, as the driver employed to operate the truck is a man of higher mental caliber and is more reliable.

**HOLT TRACTOR TESTED.**

The United States Artillery Board, consisting of General Granger Adams, Col. McGlachin and Capt. William Bryden, recently tested a 45 horsepower Holt caterpillar tractor at San Antonio in pulling a 4.7-inch gun weighing 8887 pounds. The guns were sunk deep in the mud to test the pulling power of the machine, which met fully the expectations of its makers, drawing the guns out of the mud with little difficulty.

According to the United States Geological Survey Bulletin the production of petroleum in the United States during 1915 was 281,104,104 barrels, valued at \$179,462,890, which was an increase of nearly six per cent. over the previous year. The average price received at the well was 65 cents a barrel.

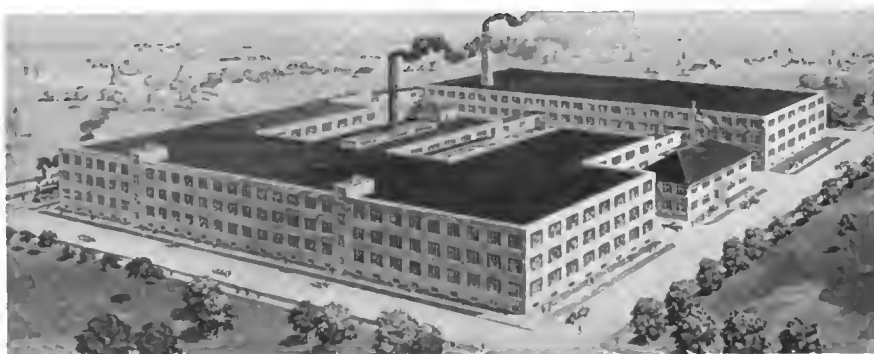
**COVERT RAPIDLY ENLARGING PLANT.**

Indicative of the rapid building operations going on at the plant of the Covert Gear Company, Inc., formerly the Covert Motor Vehicle Company, at Lockport, N. Y., is the announcement that one new building has been completed and the machinery partly installed, construction work on a second structure is well under way and plans are being formulated for a third.

Since the announcement a short time ago of the re-incorporation of the company with a capital of \$1,000,000 and of the adoption of a new name, every effort has been centred in construction work and the development of the new model transmissions that are forthcoming this year.

The transmissions are the unit and centre hung types. Only one, model L, has been announced as yet. It is designed for a 1000-pound delivery truck or light pleasure car.

B. V. Covert, founder of the original company, was a maker of bicycles and bicycle parts, but abandoned this work to experiment with automobiles in the year



Sketch Showing the Buildings Now Being Erected for the Covert Gear Company, Lockport, N. Y., to Cost \$1,000,000.

1901. His first chainless runabout was shown at the New York show in that year, it leading to considerable business with English concerns. Under the name of the Covert Motor Vehicle Company, Mr. Covert and associates produced these cars in considerable numbers, the machines selling for about \$650.

A large demand for Covert transmissions sprang up and gradually the production of Covert cars was abandoned in favor of the transmission business. Today the demand has far outdistanced the supply; hence the new buildings, which will be devoted to the manufacture of gears and transmission parts.

B. V. Covert is president of the new Covert Gear Company, P. A. Clum is treasurer, E. J. Fritton secretary, F. E. Mosher general manager and Gould Allen sales manager.

The Rich Tool Company, manufacturer of engine valves and miscellaneous metal specialties, 410 Railway Exchange, Chicago, Ill., has been admitted to membership in the Motor and Accessory Manufacturers, Inc., of New York City.



**CROP PROSPECTS INDICATE PROSPERITY.**

As the general prosperity of the country depends largely upon the agricultural production each year, there have been some misgivings among business men because of the reduced acreage in grains and the possibilities of a small total wheat crop, it being estimated that this year's yield will be approximately 30 per cent. less than in 1915.

The cotton crop has also suffered, but compensation for these losses is found in the materially higher prices now being received for all farm products, which will bring the actual return for the crops equal to if not more than what would have been received had the yield been larger but prices lower.

In industrial lines phenomenal activity continues without apparent abatement. Factories are full of orders, working overtime and getting top-notch prices for their goods. The immediate outlook, with the possibilities of peace in Europe and the approaching presidential election, has nothing threatening to business, as present buying is said to be mainly for immediate needs, speculative element having seemingly exhausted itself.

**MOTOR LINE FRANCHISE IN CHINA.**

An American concern, in return for its services in securing a loan of \$54,600, has been granted an exclusive franchise by the governor of Peking, China, to operate a motor truck service for freight and passengers over a new road to be constructed between Peking and the Western Hills.

**HYATT YEAR BOOK OF 1916 TRACTORS.**

A booklet entitled "Hyatt Roller Bearings in 1916 Tractors" has been published by the Hyatt Roller Bearing Company, Newark, N. J., and Detroit, Mich., which is also designed as Bulletin No. 307-T. It is devoted to a brief statement relative to the need of roller bearings and the development of the Hyatt products, and shows illustrations and brief specifications of heavy haulage and agricultural tractors built by 28 different concerns located in all parts of the country.

While necessarily the information is very brief, it is decidedly interesting. Hyatt bearings are used in the construction of all the machines illustrated and these range in size from the types that will serve instead of a pair of animals to those that are intended for the heaviest farm work. The booklet will be sent to Motor Truck readers at request. The large number of manufacturers whose machines are referred to constitute less than 25 per cent. of the farm tractor industry.

**BOSTON HOME FOR GENERAL VEHICLE.**

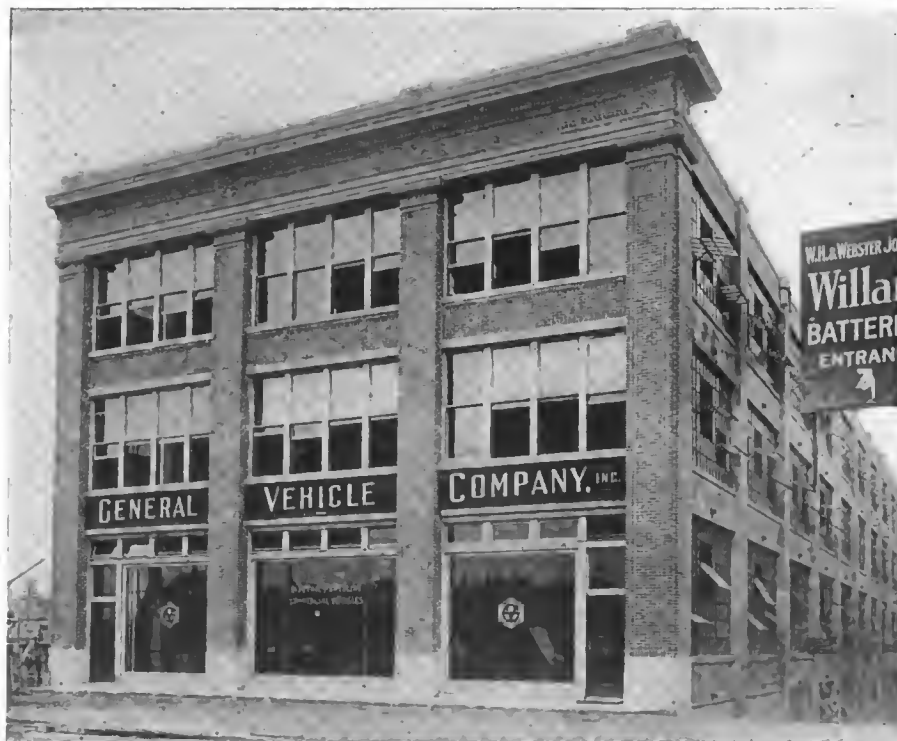
What is described as the finest sales office and service station not only in New England, but in any part of the country, has been opened by the General Vehicle Company in Boston, at 592 Commonwealth avenue, near Blanding street. The building is in the centre of three units and is of the latest fireproof, concrete and brick construction. The opening of the station was made the occasion of quite a celebration in local motor vehicle circles, and was attended by P. D.

Wagoner, president of the General Vehicle Company, and F. Nelson Carle, advertising manager.

The new building contains more than 15,000 square feet of floor space. The salesroom and general office are located in the front of the structure, while back of these is the garage and service station proper, which is laid with due regard for future expansion, as well as present needs. The stock room contains every part needed for replacements on G V trucks.

There is a complete machine shop, blacksmith and forge shop and other equipment necessary to supplement these. All machinery is electrically operated from individual motors, and there are charging panels for "boosting," as well as charging electric G V trucks.

The station promises to become one of the busiest in Boston and New England.



The New Service Station of the General Vehicle Company at Boston, Mass., Said to Be One of the Finest Equipped in the Country.

## LUMBERING IN THE NORTHWEST WITH TRUCKS.

**R**IKER trucks are affording a service in lumber camps in the yellow fir forests of the State of Washington that is not only impossible with horses, but which has really made possible operations on a larger and more efficient scale than was ever before attempted in the lumber industry in similar conditions.

There is in the neighborhood of 250,000,000 feet of lumber ready to be cut in the logging country of King county around Woodinville and Redmond. The Machias Mill Company is working a comparatively small mill near Woodinville, which is about 15 miles out of Seattle on the Machias river and the Northern Pacific railroad. From 80,000 to 100,000 feet of yellow fir lumber is cut there every day from logs measuring anywhere from 16 inches to six feet diameter at the butt and from 14 inches to five feet at the top and in lengths from 20 to 42 feet.

The Machias company in order to handle these huge logs had a special trailer made by a Seattle firm to be used in connection with their Riker trucks. This trailer was built with a heavy metal frame work mount-

and again onto a made road as far as Lake Sammish, where it is dumped into the water to be later taken in tow by a tug boat and carried to the mill. From the point where the lumber is loaded to the lake is  $7\frac{1}{2}$  miles, making a round trip of 15 miles, which is covered on the average about six times a day with 2500 feet to the load. On one day a total of 15,680 feet was brought to the mill.

This timber would not be available under any other system of haulage, as the expense would be prohibitive, even if it were possible to run a railroad into the forests, and horse equipment would prove too slow and practically impossible, as the animals could only carry small loads and would not be able to make the trip more than once a day.

Road conditions are anything but ideal, the roadways being built of heavy sharp edged boards, but despite this fact and the tremendous loads carried, the rear tires, after being driven 3000 miles, appeared to be good for the guarantee, while the front tires had not begun to show evidences of wear. The tires on



Logging with Trucks and Trailers: At Top, the Trailer Used by Smith & Olsen, Redmond, Wash., Built from the Rear End of a Truck; at Left, Smith & Olsen's Truck and Trailer at a Railroad Siding; at Right, Machias Mill Company's Outfit with a 12-Ton Load of Logs.

ed on a pair of Riker truck wheels equipped with the same type rubber tires and bearings as the rear wheels of the truck. A round reach rod with a spring connection at the front and a variable connection at the rear is used to connect the trailer with the truck.

A heavy wooden support, or bunk, upon which the logs rest, is placed on the trailer and the rear end of the trunk. This is fitted with a clip to hold the logs in position and is so arranged that it can be released to roll the logs off. The reach rods being adjustable, the load can be so placed on the trailer and truck that one-third of its weight is carried on the latter and two-thirds on the former. This makes possible loads weighing up to 12 tons, though the rated capacity of the truck is four tons.

### Averages Six 15-Mile Trips Daily.

The truck hauls the timber from the woods over a made road part of the way and then along a dirt road

the trailer, which bears the greater part of the weight, showed comparatively little wear and appeared to be good for 8000 miles. The Riker truck is driven about four miles to the gallon of gasoline in this work and about 200 miles to a gallon of lubricating oil, according to the driver's estimate.

### Short Hauls and Heavy Loads.

Another Riker truck is operated by Smith & Olson in a logging business in the same county near Redmond, which concern has a unique haulage problem to deal with. This machine hauls yellow fir logs from the cutting grounds to the railroad sidings, a distance of 1.1 miles, or 2.2 miles to the round trip. On this haul there is a long and steep hill which caused the operating firm so much trouble when they used horses that the animals were abandoned for the truck.

An average of 20 trips a day and exceptions of 21 and 22 trips have been made with the machine, hauling 40,000 to 42,000 board feet. The four horse teams

formerly used made approximately five trips a day when conditions were favorable and hauled about 2000 feet to the load. The truck, which is displacing four of the horse outfits, has only one driver, where previously four men were needed.

A trailer made of the rear end of an old Mack truck with the springs strengthened and fitted with an arrangement as described above is used in conjunction with the truck. Instead of rubber tires, however, wide steel tires are used on the trailer wheels. The average load carried is about 2200 feet in logs averaging 30 feet in length and four feet in diameter at the butt and 35 inches at the top.

No track has been kept of the tires used on the truck, but the driver estimates his gasoline consumption at four miles to the gallon and that 400 miles is covered to each gallon of lubricating oil.

#### SUITS AGAINST TRUCK MAKERS.

The Smith Form-A-Truck Company of Chicago, through its attorney in San Francisco, has entered suits against a number of manufacturers and dealers handling truck attachments, claiming infringement on its basic patent rights. Announcement had been previously made that steps would be taken to protect the patent rights of the Smith Form-A-Truck Company, as well as to protect owners and users of these trucks. The suits started are against the Ralston Iron Works, Curry & Rowe, Howard Brown and L. J. Carl. It is stated that other suits will be instituted later.

#### NATIONAL SHOW DATES SET.

Announcement is made of the dates on which the New York and Chicago automobile shows are to be held. The New York show will be from Jan. 6 to 13 inclusive, and the Chicago show from Jan. 27 to Feb. 3 inclusive.

#### PACKARD PLANTS WORKING 24 HOURS.

One of the busiest motor truck manufacturing concerns in this country today is the Packard Motor Car Company, Detroit, which is operating its several large truck plants 24 hours daily to meet the United States government's demand for motor transportation units. Illustrative of the type of vehicle being sent to the Mexican border is the accompanying illustration, showing a large number of Packard chainless trucks awaiting in the company's yard for shipment.

The Packard company is directing the attention of all material producers from which it obtains materials and parts to the Act of Congress of June 23, 1916, which requires that "in case of actual or imminent war, government orders for munitions and supplies must be given precedence over all other work."

#### ELECTRIC VEHICLES IN SOUTH AFRICA.

Consul Edwin N. Gunsaulus at Johannesburg, South Africa, in giving requested information regarding the possible market for electric vehicles in that country, says that current may always be obtained for charging storage batteries from the local power companies and that there are 780 miles of road in the Johannesburg municipal area, 25 per cent. of which is asphalted, while the remaining roads are of gravel or natural state. The grades of the roads are comparatively low, with the steepest grade one in nine.

#### F-W-D TRUCKS.

Foreign orders for F-W-D trucks manufactured by the Four Wheel Drive Auto Company of Clintonville, Wis., recently resulted in a diplomatic pow-wow in Washington between the foreign representatives of two countries now at war and the United States government officials. These foreign countries had contracted with the Four Wheel Drive Auto Company for the entire output for months ahead when the United States government stepped in and commandeered the entire output of the factory. After the foreign diplomats had made their protest a discussion was held which ended in a compromise through which all contracts will be carried out.

The F-W-D trucks gained an enviable reputation on the foreign battle fields in transporting heavy guns and ammunition under poor road conditions and the service obtained gave them precedence over other makes in this work, with the result that the Wisconsin factory was swamped with orders.



View at the Plant of the Packard Motor Car Company, Detroit, Showing a Fleet of Chainless Motor Trucks Awaiting Shipment to the Mexican Border.

**REPUBLIC TO INCREASE CAPITAL.**

The Republic Motor Truck Company, Alma, Mich., is to increase its capital stock to provide funds for the expansion of the plant and to increase production.

When the building now under construction is completed, two more will be started, which will make the factory area 200,000 square feet. A new type delivery truck will be built to sell at a low price, and it is expected that 25,000 of these machines will be produced the first year.

**ECONOMY OF TRUCKS AND TRAILERS.**

Three Pierce-Arrow five-ton trucks used by James L. Stuart in excavating the site for a new hotel in Pittsburg, Penn., hauled 75,000 yards of material in 60 days. The trucks were worked 20 hours a day and trailers were used part of the time, mostly at night, when the traffic on the streets did not interfere with their use.

The run of 1.2 miles often was covered 80 times a day between the hotel site and scows in the Alleghany river, where the material was dumped by a special arrangement designed to facilitate the work. The trucks and trailers were loaded with a steam shovel and the combined load of truck and trailer, including drivers, load and weight of machines, exceeded 14½ tons. The trailers, which were five tons capacity, had separate brakes, but no steering device, and were fitted with special dumping bodies. The trailers were abandoned toward the end of the job, as the men operating the trucks found they could get as advantageous results without them. An average of 400 yards of material was removed for each 24 hours, astonishing many contractors who from time to time observed the work and the use of the equipment.

**WILL SELL STRONG OILERS.**

The Smith Form-A-Truck Company, Chicago, Ill., has taken over the entire sales of the Perkins Manufacturing Company of Des Moines, Ia., manufacturer of Strong sight feed oilers for Ford chassis, and will inaugurate a selling campaign on the device.

**CLYDE GETS AUSTRALIAN ORDER.**

The Clyde Motor Truck Company of New York has closed a contract for 204 one-ton trucks, which are to be shipped to Australia.

**PREPARE PIKE'S PEAK ROAD WITH TRUCK.**

A White Good Roads type truck was utilized in preparing the Pike's Peak Auto Highway, near Colorado Springs, Col., for the race that was made up that ascent on Aug. 12. The truck was utilized for practically every work in connection with smoothing the roadway and insuring fast time being made in the contest. The Good Roads type truck is equipped with a dumping body that is elevated by power, and the rear wheels are built with wide steel rims so that these will consolidate soft earth when driven upon it. In average road building the weight of the truck will compact the surfaces as effectively as will a road roller, and do this while hauling loads over the roadway.

The truck was worked while the excavating, grading, filling and rolling was necessary, and when this work had been completed the body was removed and a tank installed in its place, with which water was distributed the entire 16 miles of the roadway, from the



White Good Roads Truck Utilized for Preparing the Pike's Peak Highway for the 16 Miles Climbing Contest up the Mountain.

bottom to the top, and while this was being done the surface was given its final "ironing." In blasting the rock that was removed to establish the highway more than 360 tons of high explosives were used.

**MOTOR TRUCK BODIES FOR ARMY.**

The Highland Body Manufacturing Company, Cincinnati, O., has received an order from the United States War Department for 100 1½-ton bodies at \$123 each, to be delivered within six weeks.

The Troy Wagon Works of Troy, O., received an order for 200 1½-ton bodies at \$136.75, and 200 three-ton bodies at \$152.60, to be delivered in six weeks.

A branch of the Sewell Cushion Wheel Company of Detroit has been opened in Pittsburg at 711 First National Bank building, under the management of G. Burley, who will be the permanent representative in that city.

### PERFECT SCORES FOR VIM TRUCKS.

Three Vim delivery cars entered in the Pacific-California International Exposition commercial vehicle run under severe conditions finished with perfect scores. The test was made over a route between Los Angeles and San Diego with a large field of entries. Two of the Vim machines carried 1100 pounds each and the other carried 1200 pounds. Throughout the entire trip the engines were not touched and the cars finished on time. In subsequent tests held on the demonstration grounds of the exposition, the Vim trucks also came off with first honors.

### LARRABEE-DEYO MOTOR TRUCK COMPANY.

The Larrabee-Deyo Motor Truck Company, Inc., Binghamton, N. Y., is manufacturing two sizes of commercial cars, 1½-ton and 2½-ton machines, equipped with Continental engines, Fuller transmissions, Bosch magnetos, Schebler carburetors, Sheldon axles and springs and David-Brown type worm gear drive.

### MACK TRACTOR IN LOGGING CAMP.

A Mack five-ton tractor is daily demonstrating its superior qualities and economy in the logging camp of Scearce & Meagher, Seattle, logging contractors. This company makes a business of hauling logs from the wood to the lumber mills of tide water, and has adapted a tractor for the work.

The normal load hauled by this Mack tractor averages about 14 tons, consisting of approximately 4000 feet of timber, which weighs about seven pounds to the foot. In some cases the tractor has hauled over 5000 feet, making a total weight of 17½ tons. The average load, however, is between 14 and 16 tons, one-third of which is borne by the tractor and the remainder by a two-wheel trailer. The individual logs are either 32 or 40 feet long and from 2½ to eight feet in diameter across the butt.



A Mack Five-Ton Tractor and Two-Wheel Trailer, Hauling Logs in a Washington Lumber Camp, Averaging About 14 Tons to Each Load.

### ELECTRICS FOR BERGEN, NORWAY.

Automobile dealers in Bergen, Norway, are becoming interested in the possibility of introducing electric cars and trucks there. The head of one firm recently sent his brother to the United States to arrange for the representation of electric vehicles in Bergen. A cheap supply of current is available.

Bergen is very hilly, with average grades of 10 per cent., the roads are narrow and not very good and travel is interrupted by fjords and arms of the sea, which cut into the coast. But notwithstanding the American consul reports that the use of electrics is believed to be feasible and that the business people are interested in these vehicles.

### CAUSE OF ROAD WAVES.

B. S. Newcombe, a surveyor, who has made a study of the roads in England, says that the primary cause of "road waves" is an unstable foundation and that subsoil draining can be employed as a corrective with the replacement of good new material. He also states that the waves are caused somewhat after the manner to those on the surface of the water, but that only extra heavy traffic would have this result.

### NEAL VICE PRESIDENT OF G. M. C.

Thomas Neal of Detroit, formerly president and chairman of the board of directors of the General Motors Company, has been elected as a vice president of the corporation to succeed Emory W. Clark.

In 1910 Mr. Neal succeeded W. C. Durant as president of the General Motors Company and during his term of office paid off the \$15,000,000 advanced by eastern bankers to finance the concern.

### HAUL MILK WITH MOTOR TRUCKS.

Large trucks hauling trailers have been experimented with by the Mitchell dairy, which does most of the milk business in Bridgeport, Conn., to haul milk to the city every day from the country districts on which it depends for its supply. The trucks are loaded with 100 40-quart cans of milk and each hauls two trailers of large capacity. One of these trains was used to supplant railroad service, which has become slow because of the freight congestion, and has proved so successful that two others have been put in use. The company is now buying heavily and on the first of June 15 such trains were in use at Bridgeport. About 100,000 to 125,000 quarts arrive daily.



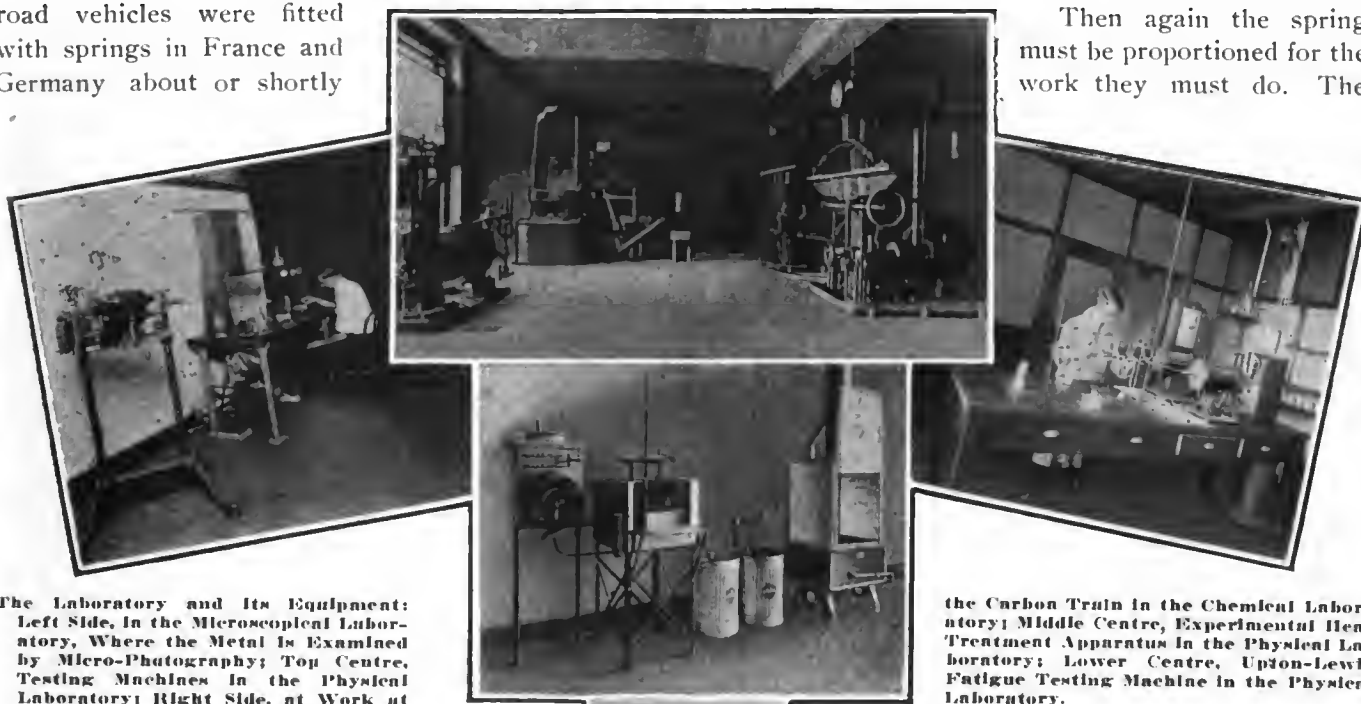
## LABORATORY TESTS INSURE SPRING QUALITY.

**Plants of the Western Spring & Axle Company Are Operated by Standards Based Upon the Composition of Metals to Obtain Uniform Excellence of Products.**

**S**PRING suspension is a vital factor in motor vehicle construction. In fact, there is no detail that should be given more careful attention by engineers. Springs were first used to obtain greater comfort and to protect the passengers in carriages and coaches that were drawn by animals, because the highways were rough and with bodies mounted on dead axles, or on straps so that they might swing, riding at even a slow pace was not to be regarded as a pleasure. The first road vehicles were fitted with springs in France and Germany about or shortly

driven on level or even surfaces and at given speeds, but the condition of the highways and the velocity of movement are extremely variable, and yet there is a desire to construct what will be equally satisfactory, no matter what the road surface or the speed. The spring must be so formed that it will afford easy riding in any condition within reason and absorb the slightest shock as completely when the vehicle is moving slowly as when it is driven to maximum.

Then again the spring must be proportioned for the work they must do. The



The Laboratory and Its Equipment: Left Side, in the Microscopical Laboratory, Where the Metal Is Examined by Micro-Photography; Top Centre, Testing Machines in the Physical Laboratory; Right Side, at Work at

the Carbon Train in the Chemical Laboratory; Middle Centre, Experimental Heat Treatment Apparatus in the Physical Laboratory; Lower Centre, Upton-Lewis Fatigue Testing Machine in the Physical Laboratory.

after 1750, and soon after they were used to some extent in England. The suspension of vehicles on elliptic springs was patented by Obadiah Elliott in England in 1804, and springs of the types and forms now utilized for carriages, wagons or automobiles may be said to be developments from the practise that was established by Elliott.

Spring improvement has been brought about by study of the requirements of springs and observations of results. First of all the automobile spring serves to make the machine comfortable for the passengers, second, it protects the mechanical construction against extreme vibration, and third, it protects the tires. These are three primary purposes in a good spring, and these qualities are obtained by form or shape, by design of the leaves or members, and by the character of the metal.

The first consideration, comfort of the passengers, would be far easier to obtain were the machines to be



pleasure car spring differs from truck spring in that the latter must sustain a maximum load and have its greatest efficiency, although the comfort of the driver or the passenger may be a secondary consideration. But the springs will not differ to any extent in principle of use and the variance in quality is obtained by proportioning with reference to length, width and thickness and number of leaves. Obviously, the spring must have adequate strength with minimum weight, because cost is a material item so far as metal is concerned, and lightness is essential when its relation to power consumption is concerned.

Steel is destroyed by crystallization or granulation, which is resultant from bending or vibratory stresses, and there is a limitation to the service of any metal. This destruction is known as fatigue, this being the point when the metal will no longer absorb the vibrations and will break. Steel can be alloyed with differing elements, which will have the effect of puri-

fyng it (eliminating what will lessen its quality for varying uses), and it may be made more ductile or to have varying degrees of hardness so that it will have variance of endurance. Thus steels are generally known by combination of other metals with them, the proportion being determined by formula in the making, and by chemical and physical analysis after it has been produced.

#### Steel Alloys Made to Formula.

There are varying processes for making steel and each of these is used to produce metal that is designed for a known purpose. After the steel has been made it is assumed to be to a specification or formula and should contain exact proportions of the elements composing it, but in practise each "heat" may vary slightly despite the greatest care in preparing it. Steel is hardened by cooling it either quickly or slowly in water, oil, molten salt or some other element, and it is tempered or "heat treated" by heating to a given or approximate temperature and again cooling it slowly or quickly. Before

scientific methods can insure to the exact specification, but the steel maker's analysis of chemical composition is, owing to unavoidable conditions, met with in its manufacture, not always an infallible record of the proportions of the contained elements, and there is often considerable variation between the analyses of different "heats." For this reason there is need of the most careful and thorough analysis of each heat before the raw material can be released for spring making. This also shows the value and the importance of the laboratory.

The Western Spring and Axle Company, with executive offices at Carthage, Cincinnati, O., is composed of the Cleveland Axle Manufacturing Company, Canton, O.; Cleveland-Canton Spring Company, Canton, O.; Hess-Pontiac Spring and Axle Company, Pontiac, Mich.; Hess Spring and Axle Company, Cincinnati, O.; J. B. Armstrong Manufacturing Company, Flint, Mich.; Champ Spring Company, St. Louis, Mo.; Cincinnati and Hammond Spring Company, Cincinnati, O.; Spears



Heat Treating Equipment and Its Uses: At Left, the Salt Bath for Tempering the Metal at the Ansted Plant, Connorsville, Ind.; at Centre, a Pyrometer System Switchboard by Which Temperature of the Furnaces Is Maintained; at Right, Section of the Heat Treating Department of the Armstrong Plant, Showing the Furnaces.

high temperatures were accurately obtained steels were hardened by cooling or "quenching" in water or oil and after brightening or polishing was again heated and "tempered" by observing the "color." Obviously precise results could not be obtained by this manner of "tempering," although surprisingly good "temper" was frequently found.

Steel as produced by practically all of the mills is made to formula, the proportioning of the elements being very carefully done and to weight, and the method of heating is not varied. The manufacture of steel is directed by the chemical and physical laboratories, which are maintained for the purpose of establishing quality and obtaining as nearly as is possible the exact composition required by those for whom the metal is produced. Broadly speaking, the desirable service qualities of steel are the result of chemical composition, heat treatment and mechanical treatment.

#### Why Steel Analysis Is Necessary.

Assuming that a steel maker receives an order for a specific quality, this metal is produced as nearly as

Axle Company, Wheeling, W. Va., and Ansted Spring and Axle Company, Connorsville, Ind. The laboratories of this company are at Detroit. This company is a very large producer of automobile springs and these are manufactured at the Cleveland-Canton, Hess-Pontiac, Armstrong and Ansted plants. The policy of this company is to have all of the plants served by one laboratory that necessarily determines the quality of the metal used, and directs the manner of heat treatment. The designs of the springs are produced by the engineering department.

#### Laboratories Very Important.

One will realize that with nine plants to serve the laboratories of this company are an extremely important department, and with products of varying grades and qualities to produce the work of the laboratory staff is broader in scope and more diversified than were its service for one establishment.

The steel used is ordered to specifications and each "heat" delivered is analyzed separately. Drillings are made from specimens of each heat and in the chemical

laboratory determinations are made for carbon, manganese, Silicon, phosphorus, sulphur, chromium, vanadium and nickel, and other elements should these be required in the specification. But with the chemical composition of the metal known physical properties can only be forecasted to a limited degree, as heat treatment has much influence upon these physical properties.

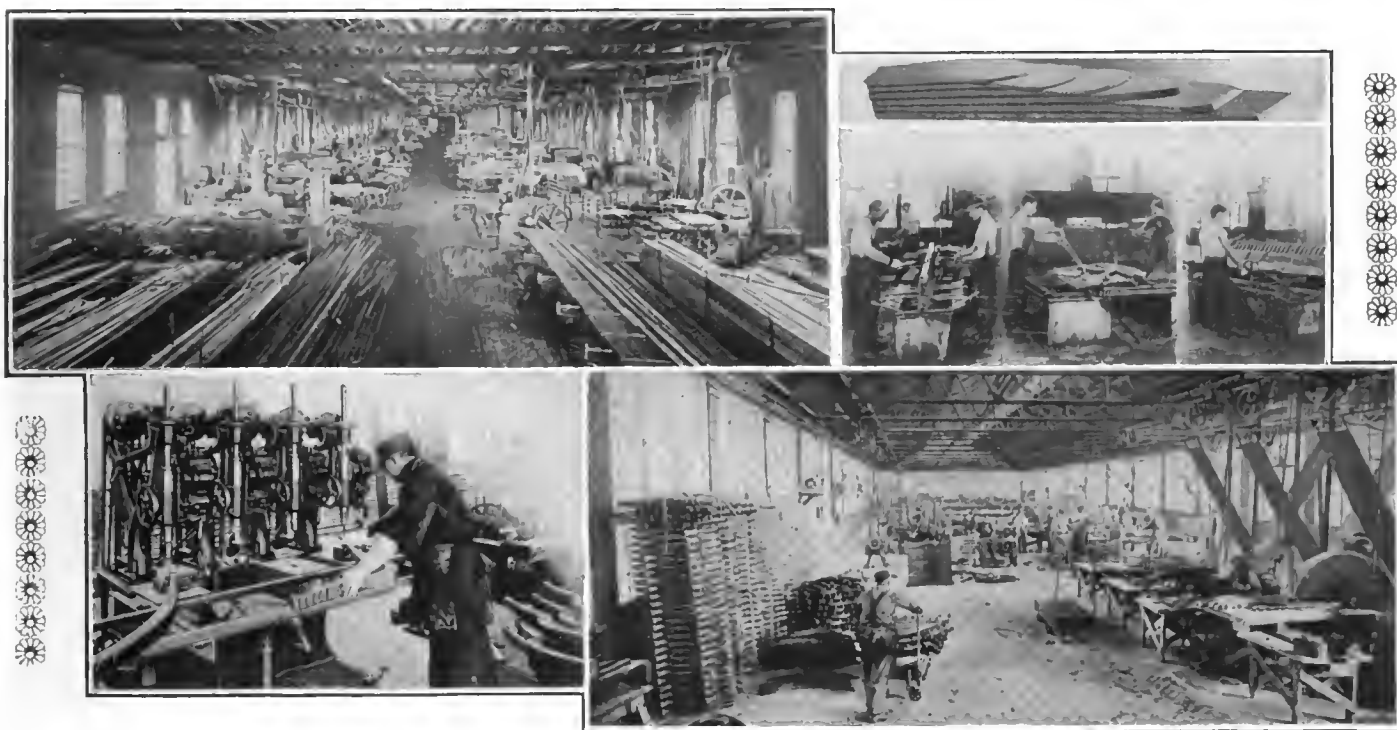
#### Physical Properties of Spring Steel.

Statement is made that the physical properties for spring steel must include high elastic limit, good elongation, a very fine grain, and it must bend not less than 90 degrees when cold. This combination of properties is obtained in three ways: 1, careful steel mill practise; 2, chemical analysis, and 3, heat treatment. A steel to be normally constituted must be allowed to "freeze" (cool) from its molten condition to its solid

Besides variations of components there are variations in conditions as well, as for illustration, the pearlite may be granular or lamellar, dependent upon circumstances, or the structure may be abnormal.

#### Physical Tests in the Laboratory.

Given the physical properties desired and assuming chemical analysis has shown the elements are within the prescribed limits for variation, a test piece is given an experimental heat treatment in the laboratory. The piece of metal then goes to the physical laboratory, where it is tested for tensile strength, hardness, fatigue and other qualities, with further microscopical examination. If the tests show the required physical properties the raw steel is released and full data concerning the heat treatment is furnished the plant that will use it. However, should the first experimental heat be unsatisfactory, others are carried



Characteristic Scenes at the Hess-Pontiac Plant of the Western Spring and Axle Company: Upper Left, the Forge Room, Where the Steel is Cut and Formed; Lower Left, Forming the Eye of the Master Leaves by Machine; Upper Right, Typical Points of Hess-Pontiac Springs; Middle Right, in the Fitting Department; Lower Right, the Finishing Department.

cold state, within what may be regarded as normal time and uninfluenced by what may be said to be adverse environment. In general, slowly cooled carbon steel satisfies the condition and results in the normal selective eutectoid agreeable to the total of carbon, whatever it may be in point of magnitude. A perfectly uniform product has the intrinsic merit of being uniformly good or uniformly bad throughout, which in itself is much to be desired, for then, upon devising a mixture and a process obtaining good results what may be regarded as staple can be duplicated at will.

Microscopic examinations of the metal are made, together with micro-photographs, for knowledge of the micro-structure is essential when there is desire to know just what transpires in the metal and to note changes in the metalloids or in the carbon content.

on until the required properties are obtained, or that the steel is unfit for use because of its chemical composition is definitely proven.

Of course the chemical and physical laboratories are equipped with every desirable apparatus and machine for making the tests with great accuracy, as well as a small plant for heat treatments, so that any process devised in the laboratory can be continued in the works. In the cooling of soft steel from 1000 degrees centigrade, at 850, 750 and 675 degrees respectively, there are periods of retardation of cooling that are known as critical or transformation points, and if a piece of steel is heated through the critical stage all previous crystalline structure, however coarse or distorted, is obliterated and replaced by the finest possible structure that the metal can assume. This is



Testing the Spring After Assembly in the Power Test Machine, Which Determines the Character of Heat Treatment.

especially true of high carbon steel, such as is used for springs. For every degree in temperature that a piece of steel is heated above the critical range the grain size is proportionately increased. Coarse grain makes steel weak and brittle. As sudden cooling serves to fix the structure possessed by steel before cooling, it is important that the temperature to which steel is subjected be carefully controlled. This is done in the plants by scientific methods. The springs as they are brought to the heat treating departments are semi-annealed, for in the fitting department the plates are just chilled enough to hold their shape after forming them, and while at red heat they are set aside to cool. This serves as a mild annealing process, after which the heat treatment is given.

#### How the Springs Are Made.

Steel that has passed the specification is released from the steel sheds at the works and taken to the forge rooms in which a number of different operations take place. It is cut with shears into lengths and the main or longest plates are taken to the eye-forming machines, which form the eyes by turning either end, and the other plates are tapered from centres to ends by rolling. The furnaces for heating the plates are operated by careful and expert workers, as much damage might be done by careless heating. To prevent the plates being heated too far back stops are placed in the furnaces so that the metal can be placed in the fires the depth that will insure heating a definite temperature for the specified lengths. The temperature of the steel for these operations is about 1800 Fahrenheit, as it can be rolled more readily at higher temperatures. This will make the grain coarse and crystalline. As the rolls compress the metal the crystalline structure is broken and replaced by a much finer structure. The temperature of the steel falls to the upper transformation point just as the rolling is finished and the metal retains this fine grain.

In the fitting department machine work is preferred to any method of hand fitting, for when hand fitted there may be considerable warpage of the steel and after heat treatment the plates must be fitted cold by the use of a large hammer and a spring fitter's anvil.

This manner of fitting often ruptured the metal and was frequently the cause of spring failure in service. There is no need of hammering the plates when fitting machines are included in the equipment, and much better springs are obtained, not only as to fit, but with reference to the effect of the work with hammers. With spring fitting machines the springs are quenched into oil while held in the required shape.

#### Heating Treatment Carefully Controlled.

The furnaces in which the springs are heated are controlled by pyrometer systems and very uniform results are obtained. A system of colored lights connects each furnace with a central station so that the furnace man is informed by lights as to the temperature of his fires. A white light signifies the correct temperature, a red light that the temperature is too high, and a blue light that it is too low.

The steel remains in the furnace until it is thoroughly saturated with the temperature, the point of saturation being determined by the uniformity of color between the furnace and the steel. The pyrometer systems in all the plants are carefully checked by an experienced man from the laboratory. Base metal couples are used and these are made in the laboratory of the company and are checked before they are used.

After the steel has been heated it has the finest grain obtainable, with maximum elastic limit and minimum elongation or ductility. The springs now receive the second operation of heat treating, by which they are tempered. This is done by placing the plates in a metal basket, so spaced that they will not touch, and lowering the basket into a cast iron tank containing a hot solution of sodium and potassium nitrates, where it is allowed to remain for a specific period. The salt bath is heated by oil burners and the salt melts at 600 degrees Fahrenheit, and can be heated satisfactorily to 1200 degrees. The correct temperature for drawing is found by experimental and research work in the laboratories.

#### The Assembly and Final Tests.

After heat treatment the springs are bolted to-



Capacity Testing Machine, Which Shows Whether or Not the Assembly Is Equal to the Work for Which It Was Designed.

gether and inspected for workmanship, and are also placed in the Evans power tester. In this machine the spring is subjected to high pressure sideways to a straight line. Upon release the spring is inspected for "initial set," for if the heat treatment has not been correct this test will indicate this condition. If too stiff the plates will break, or if too soft they will be bent. All springs must pass this test before passing to the finishing department.

In the finishing department the fine finish that is characteristic of all Western springs is given. Each plate is scaled on an emery wheel, the edges are ground on large sandstone wheels, and the rolled, tapered ends are chamfered on these larger wheels. The plates are then polished on emery belts, and before being bolted together the leaves are lubricated with a graphite grease that prevents rusting and reduces friction between them. When the springs are finally assembled they are given the capacity test in an Olsen spring capacity testing machine, and each assembly is tested to insure that it carries a definite load at a certain height for which it is designed. After this test the spring is passed to the sales department and the shipping room.

#### RAISE IN FERRY RATES OPPOSED.

A proposal to increase ferry rates for motor trucks on the Boston municipal ferries, made by Mayor Curley of that city, is already receiving strong opposition from the residents of the East Boston section. It is understood that the mayor proposed to raise the rate from eight and 10 cents to 10 and 25 cents. Automobile dealers, business men and others have organized in opposition to the increase and have asked for a public hearing.

#### BIGGER PACKARD PLANT IN BOSTON.

The Packard Motor Car Company of Boston, of which Alvan T. Fuller is owner, has contracted for a large addition to its present plant at 1089 Commonwealth avenue. The addition will cost \$250,000 and will provide 150,000 additional square feet of floor space, making the total at the plant 250,000. A sales room for used cars will be located on the first floor of the new wing, the second floor will be used as a sales room for trucks, while the third floor will be occupied by the new car delivery department. The fourth floor will be utilized for storage purposes. A U-shaped link will connect the new building with the old and the space in it will be used for an extension of the truck repair department and additional space for the storage of bodies.

#### EQUIPPED WITH STRONG OILERS.

The Strong sight feed oiler for Ford chassis has been made factory equipment on all Smith Form-A-Trucks. This oiling device gives a positive forced feed oiling, the oil being drawn from the flywheel case and pumped through a gauge on the dash into the front of the crank cases, the pump having a capacity of one-half gallon of oil per thousand revolutions of the motor. It not only insures a cooler and smoother running motor, but saves 50 per cent. of the oil ordinarily consumed. It also prevents burning out connecting rod and crankshaft bearings. An order for 50 000 of the oilers has been placed by the Smith Form-A-Truck Company.

#### UNION TRUCK COMPANY FORMED.

The Union Truck Company of Bay City, Mich., recently organized, will construct a truck designed by H. E. Woodworth, vice president and general manager of the company.

At a meeting of the stockholders held in the Bay City Board of Commerce the board of directors was created as follows: James R. Tanner, H. E. Woodworth, E. C. Tibbitts, C. B. Chatfield, H. E. Buck and W. H. Boutell. The board elected the following officers: President, J. R. Tanner; vice president and general manager, H. E. Woodworth; secretary, E. C. Tibbitts; treasurer, George Beaulier.

#### STUDEBAKER BUYS OTTOFY PATENT.

The Studebaker Municipal Utilities Company was recently organized for the purpose of acquiring the Ottofy patents, covering street flushing machinery, which has been the subject of much litigation in the courts for the past five years. This concern will manufacture under these patents and the machines will be marketed through the Studebaker organization.

The Ottofy patent, No. 795,059, covers "any flushing machine made or that can be changed or adjusted to deliver a flat stream of water under pressure, forward and laterally, at an angle of 20 degrees or less.



Three Republic Trucks That Are a Part of the Travelling Equipment of the Levitt-Tanier Shows United, a Western Circus Enterprise.



## GIVE MILITIA WAR TRUCK

### Armored Reo Chassis Sent to Michigan State Camp for Soldiers' Use.

An armored Reo truck was recently delivered at the concentration camp at Grayling, Mich., as a gift from the Reo Motor Truck Company, Lansing, Mich., for the use of the state militia.

The machine was designed by Horace T. Thomas, chief engineer of the Reo Company, and conforms to the latest ideas in foreign practises brought out by experience in the European war. In speaking of the ideas followed out in producing the truck, Mr. Thomas says: "In designing it we had in mind several things, first of which, of course, was standardization. Lightness and speed are other requisites, and so this Reo war truck, which has room for four machine guns and their operators, beside the chauffeur, weighs only 4200



Armored Chassis Presented to the State for the Use of the Michigan Militia by the Reo Motor Truck Company.

pounds complete, and can be driven 35 miles an hour.

"An interesting feature of this machine is the thinness of the plate with which it is armored. Looking at it superficially, one would naturally suppose that the plate must be at least half an inch thick, and therefore be very heavy. As a matter of fact, in our experiments we discovered a peculiar thing—that the modern high velocity rifle steel coated ball would easily penetrate a half inch of case hardened steel, and, for that matter, much greater thickness. After experimenting for some time we conceived the idea of using two thin plates of steel separated by an air space, and when we did that a peculiar phenomenon was witnessed.

"The same rifle ball shot at a plate a fraction over an eighth of an inch thick and separated from another plate by about three-eighths of an inch, penetrated the first plate, but was stopped by the second one. The answer is simple—the impact against the first plate

flattened the bullet, so that it was easily stopped by the second one. For actual warfare conditions steel discs may be added to the wheels to protect the spokes. The curved steel bar which extends from the radiator to the point above the driver's head is designed for cutting barbed wire entanglements."

### SEWELL CUSHION WHEELS.

The Sewell Cushion Wheel Company, Detroit, Mich., during the first quarter of its fiscal year shipped orders showing an increase of 300 per cent. over the volume of business done in the corresponding period of the previous year.

This is the eighth year that the Sewell Cushion Wheel has been operating and the business is growing continually. Plans are now making to establish service stations, in connection with their branches in Buffalo, New York City, Philadelphia, Baltimore, Minneapolis, Rochester, Cleveland, St. Louis, Pittsburg, Los Angeles, Seattle and Chicago.

The first set of these wheels were put in service by the Marx Market Company of Detroit. They were made by hand in a small blacksmith shop in Detroit under Mr. Sewell's direction. At first business was anything but rushing, as the truck had not gained its great popularity and the additional expense of equipping the machines with Sewell wheels was a bugaboo with truck owners. There were a few users, however, and the satisfaction they obtained from the use of the wheels was soon general knowledge, with the result that orders flowed in fast. In April, 1912, a \$300,000 company was organized to manufacture and sell the invention.

### RYAN CONTROLS STROMBERG COMPANY.

Allan A. Ryan and a group of prominent financiers have acquired control of the Stromberg Motor Devices Company of Chicago, Ill., which will be taken over by a new concern to be organized and known as the Stromberg Carburetor Company of America. An issue of 50,000 shares of the new concern's stock, of no par value, will be made.

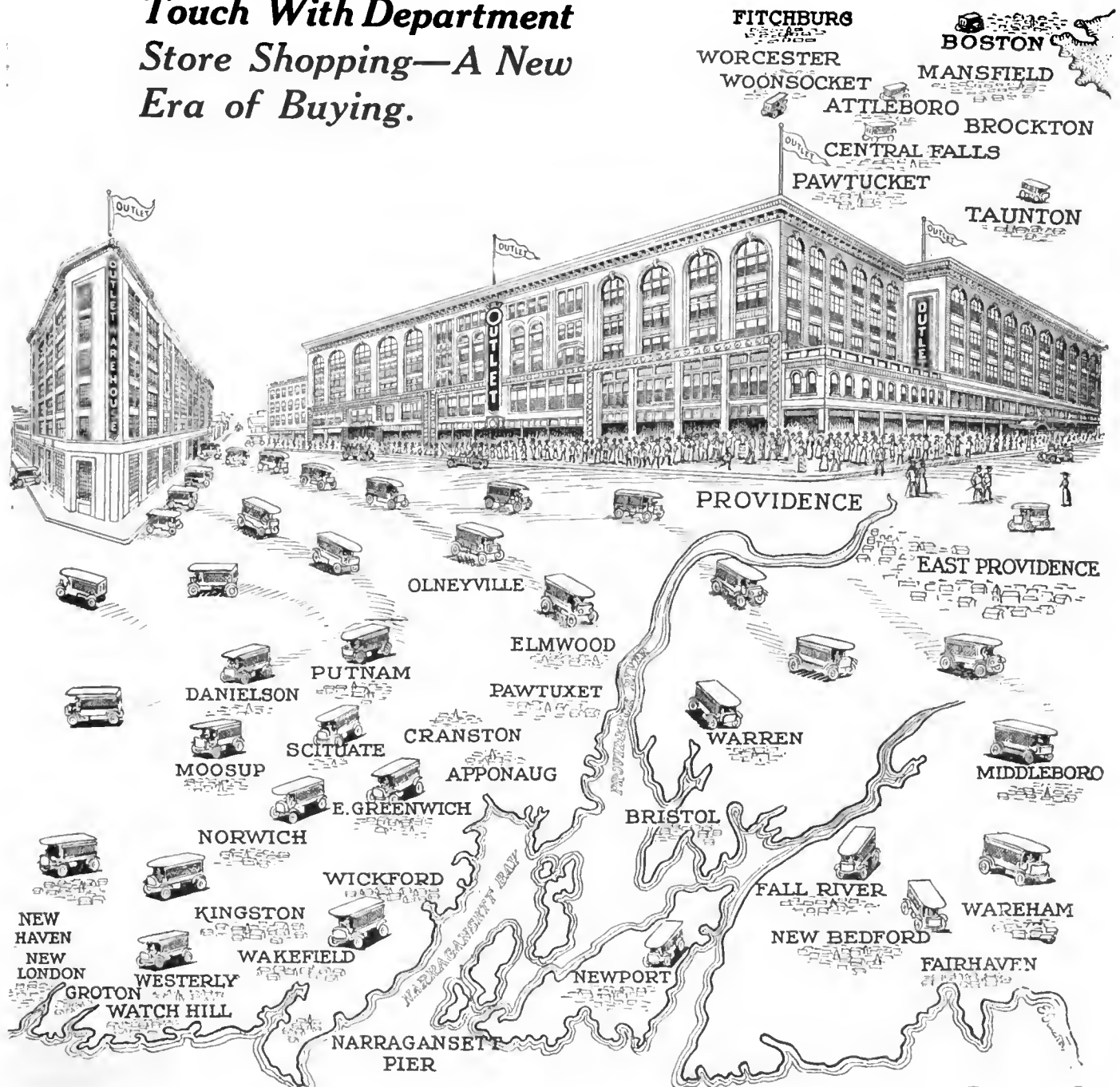
### BARKER WITH "OLD HICKORY."

J. M. Barker, who was formerly with the International Harvester Company, has become associated with the selling force of the Kentucky Wagon Manufacturing Company, selling Old Hickory motor trucks.

# OPPORTUNITIES

In a  
**DELIVERY CAR SERVICE**

*Great Suburban Population Brought in Close Touch With Department Store Shopping—A New Era of Buying.*



## MERCHANDIZING WITH A MOTOR TRUCK FLEET.

### How the Manufacturers' Outlet Company, Providence, R. I., Deals with Suburban Patrons with Its Delivery Equipment and a Drivers' Order System of Selling.

**T**HAT the motor truck is not only a means of delivering merchandise more satisfactorily and over a much larger area than is practically possible with horse drawn vehicles, but is also an agent, that, when systematically utilized can be made to greatly increase business, is being demonstrated by one of the largest department stores in New England, the Manufacturers' Outlet Company, Providence, R. I. This concern is one of the most progressive and enterprising of its type in America and does an enormous business. It has used motor vehicles in its delivery for seven years and it has a highly developed and efficient organization that serves not only the entire state of Rhode Island, but a large section of Eastern Connecticut and Southeastern Massachusetts. There are 29 vehicles of all kinds operated at present.

The name Outlet typifies more than a department store business, for it represents a phenomenal success that has been achieved in a comparatively few years.

and the people were soon convinced that the name Outlet typified quality in merchandise, lowest prices and the best of service. And there was assurance that dealing with this concern, no matter what the methods, either in person or by mail or telephone, its statements could be relied upon—that inspection of merchandise before buying was not necessary to obtain the fullest satisfaction.

#### Progress in Every Department.

The company established a system of delivery that was as satisfactory as any other part of its organization, thoroughness of distribution, speed and punctuality being the basis of this service, and as soon as automobile vehicles were sufficiently developed to be regarded as reliable means of transportation, machines were adopted instead of animal wagons and trucks. Modernity and progress have been as marked in the delivery system as in any part of the company's operations.



The Fleet of Autocar Trucks Utilized for Suburban and Long Distance Delivery by the Manufacturers' Outlet Company, Providence, R. I., It Having 13 of These Machines.

Though stores that have been established more than a half century have been but slightly increased, the Outlet has constantly and consistently grown from a small store room on an obscure thoroughfare to a mammoth emporium that covers more than a city block and which occupies more than 350,000 square feet of floor space.

The foundation of this success, which has been amazing to merchants and people alike, is on simple rudimentary principles that apply to all successful merchandising—preparedness and service—and the maintenance of these principles is the constant endeavor of the management. From the outset extremely high standards were established, and that these have been lived up to is demonstrated beyond doubt by the constantly increasing patronage that has been bestowed upon the store. The synonymous slogan "once a customer, always a customer," was adopted

When the delivery organization had been brought to the highest condition of efficiency there was realization that with such a constant and reliable means of communication between the store and its customers, and with a few additional units and co-operative endeavor by the heads of the different departments, the out-of-town patronage could be enormously increased, and buyers would be greatly inconvenienced and would materially economize in buying, for personal visits to the store would not be necessary to obtain any one or number of articles.

With the drivers of the delivery trucks visiting thousands of homes daily there was promise of development of business that previously had been unobtainable, and which had almost unlimited possibilities. The service was established and it has already reached large proportions, for suburban residents quickly realized the convenience of giving orders to

the drivers and having goods delivered the same day or the day following, and having the assurance that these orders received attention that would afford complete satisfaction.

#### **Educating the People a Necessity.**

There were numerous factors entering into the organization and maintenance of this service that required co-ordination with the operation of the other departments. These were not radical, but it was necessary to apply them to harmonize with the different departments and with each other to obtain the desired results. The store was prepared to serve any number through this method of purchasing, but the people apparently responded slowly to endeavors made to encourage them to buy directly through the motorized delivery service. Whether or not it would be successful was uncertain.

The city residents, however, many within walking distance from the store, quickly accepted the opportunity to save time and money from the "shopping" division of the delivery department, as they found it quick and reliable and in every way satisfactory.

means that the expense of travelling and the time required more than offsets the actual saving through difference in prices. They are equally well informed that this time and money can be saved if they purchase from the large city store, but they seemingly doubt that they can obtain the quality and value they could did they personally purchase, never realizing that the big store may have spent hundreds of thousands of dollars in equipping and maintaining a delivery department that affords this service, and that every endeavor is to encourage patronage and to retain it when it has been bestowed.

The proof of the efficiency and value of such a service, by which out-of-town dwellers may do their shopping as economically and satisfactorily as the city residents, is found first in the existence of the system, and again in the fact that customers who have suburban summer homes avail themselves of it almost entirely when absent from city, in some instances giving over shopping until return in the early autumn. With the growth of the city and the large increase in the number owning and occupying summer homes, either



**The Eight Electric Trucks Used for Package and Bundle Delivery on the City Routes by the Manufacturers' Outlet Company, Making Three Trips Each Daily.**

When the driver of a delivery truck called he could be given an order from a memorandum, and this order could be delivered the next trip. The same service was equally available to those living in the suburbs, and there are no conditions that would militate against it, only the suburban customers did not appear to realize that there was greater convenience and economy for them than obtained for the city residents.

#### **Problem Required Careful Study.**

The immediate approval of the system by those who were the most frequent customers and the most critical buyers was evidence enough of its merit, but the fact that the out-of-town patrons did not take advantage of what was intended primarily for their benefit was a problem that required careful study to reach a solution. The answer was that the people whom the system could best serve were not sufficiently informed of the possibilities of purchasing through it, and failed to realize the advantages. There was no question that people residing outside of the cities understand that the large stores sell merchandise far below the prices of the shops in the small cities, towns and villages, and yet to purchase in the large stores

in the country or at the shore, a considerable part of the population must either visit the city stores or buy through the service systems. Where vacations were the rule a few years ago, families abandoned their homes for the open air life that more appeals to them and enjoy months of satisfactory pleasure that would not otherwise be obtainable. Yet they cannot divorce themselves from the stores and they demand the saving and economies that the large enterprises have specialized.

#### **How the System Works Out.**

How this system of purchasing works out from the practical viewpoint is the most important fact in the mind of the customer, and the buyer must become thoroughly informed of it before the numerous advantages can be appreciated. "Are the results as satisfactory from this system as were one to make a personal visit to the stores from a distant place of residence?" is the question the customer first asks. "Yes!" is the answer, without any qualification. A long and careful study of the system by the store management has made it well nigh perfect so far as service is concerned, and the results from the viewpoint of the buy-



Loading the Autocars Used for the Suburban Delivery, That Make One Trip Each a Day, Covering Long Mileages.

er are satisfactory from every viewpoint. Besides the actual saving in expense for car fare, tickets, lunches, etc., one does not endure unpleasant travel conditions, avoids delay, heat, storms, and there is not the need of carrying packages, to say nothing of the saving in time and comfort.

Besides the monetary saving incident to personal purchasing, and the elimination of the general advantage of economizing time and greater comfort, modern methods of department stores afford a means to buyers making even more substantial economies through informing them of practically every opportunity for purchasing exceptional values. This might be obtained by constant visits to the stores were the customers within easy reach of them, but the out-of-town resident cannot afford to do this save through the delivery service, which has possibilities for buying that are equal to those enjoyed by city dwellers.

#### Modern Merchandising Methods.

Present day buying is entirely different from even a few years since, and the methods of the stores are equally variant as compared with those that formerly obtained. Custom was for the store to establish prices and display goods, making no change so long as there was stock remaining, and this method is still the vogue with many small stores. But the department store, especially if it is of large proportions, has special sales practically every day, offering goods at prices that are below normal market values and disposing of stock quickly.

Such sales are widely advertised in city and suburban papers and they are patronized immediately by those to whom the reductions and the qualities appeal. The suburban buyers were unable to purchase at such sales unless visiting the store personally until the establishment of the delivery

service which would bring to the customer whatever was offered for sale, at advertised prices, and with the guarantee of the store that quality and value were absolutely as represented. The service is at the disposal of every resident in the area which the delivery serves and the goods are obtainable as quickly as though personal purchase was made and sent out.

No matter how distant the buyer may reside there is undoubted satisfaction in making personal selection, and while there would be a desire to make a choice from a considerable number of available styles or types, the prospective purchaser will undoubtedly visit the store which ordinarily is patronized. This is particularly the case if the customer is a woman, whose visits to stores is not frequent and who desires to "shop" for the purpose of informing herself relative to styles and colors and the general details of costumes. Such shopping trips are real events in the lives of many and yet their patronage is bestowed where quality is known and satisfaction is certain.

The advertising service of the Outlet is well worth a study, for it has been imitated by many concerns, as it is regarded as having an optimum of publicity merit. It is prepared with a view of it reaching the entire zone served by the delivery equipment of the store, and all advertisements (as is shown in the accompanying illustration) are written and illustrated so that they contain individual and explicit declarations of each article offered for sale. These usually appear in evening publications, which reach all suburban sections the day they are published, and by examining these advertisements and making memoranda, the buyer can give order for any one or number of these special offers the following morning to the driver of the delivery truck making



The Furniture Loading Platform at the Garage Main Floor That Is Served by Two Large Elevators to the Warehouse Floors Above.



distribution in that locality. The value of this publicity is directly beneficial, but patronage is stimulated by the fact that the delivery truck, passing the homes or making distribution to them, emphasizes purchasing possibilities that can be anticipated and taken advantage of.

#### **System Has Produced Results.**

The education of the population of a very large area to buying through the delivery service has been productive of substantial results and the volume of business that is transacted through this system is constantly increasing. Through the advertising mediums the public announcements of the sales are made, care being taken to make the advertisements specific, so that there will be definite knowledge of quality, brand, style (if any), sale price and former price or value, and whenever possible an illustration is used to fully present and impress upon the reader the character of the merchandise. There are frequent announcements of the service and customers are assured that they will obtain positive satisfaction. The entire resources of the store are at the disposal of the purchaser who may require special attention.

The customer from a locality comparatively remote from the store may be sure that an article advertised is exactly as represented, that it will be carefully selected in the store, that imperfections and faults will be detected by close examination, and that it will be guaranteed fully as to quality and condition. The drivers of the delivery wagons are supplied with order blanks or order books, and they may be given specific orders or clippings from advertisements, which will exactly show what is required. The drivers are careful that the orders are understood by them, and when these are received at the store they are filled by experienced sales people, whose judgment is dependable and who seldom have difficulty with even a vague designation. Where a customer is dissatisfied an exchange can be made, and emphasis may be made that the number of exchanges required from this service is surprisingly small as compared with the requirements of city customers. The chief advantage of this system of buying is in the efficiency of the delivery organization, which has been developed with the purpose of affording as near ideal service as is possible.

#### **The Facilities and Equipment.**

The Outlet store shipping department has facilities and equipment that are better planned and organized than are those of any other department store in America, a fact that justifies the statement that it is a leader in merchandising. There are others that have more vehicles, but none that has a centralized system of operation that affords such economy and insures such certain results. The change from animals to automobiles was made in 1909, after the company was convinced of the utility of machines, but the equipment has been acquired and each unit has been chosen with special reference to the work to be done, and this is operated from one of the largest combined ware-

house, garage and shipping or delivery station in the United States.

This building, a fireproof structure, six stories and basement, is located in the block directly back of the main store structure, and it is constructed with the purpose of economizing time and labor and facilitating the work of the department for which it was designed. The city delivery is made with electric machines that leave the delivery station at 8:30, 1 and 4 o'clock daily, making three trips to practically all sections, but on Saturdays the departures are at 9, 2 and 5:30. The suburban delivery trucks leave at 8:30 each morning and cover an extremely wide zone. These



Suburban Truck Helper Delivering a Package and Receiving an Order to Be Delivered the Following Day.

city and suburban deliveries are free. Purchases exceeding \$2 in value are delivered free anywhere in Rhode Island and in Rehoboth, Taunton and Fall River, Mass.; purchases valued at \$5 or more are delivered free within a radius of 50 miles and purchases of \$10 or more anywhere within a radius of 100 miles. With this system the goods will be delivered the day following purchase within the 100 mile radius.

#### **Has 29 Motor Vehicles in Use.**

The delivery equipment consists of 29 automobiles, of which 12 are electric and 17 gasoline. The five 1000-pound Commercial electrics are used for route deliveries; the three 2000-pound Walker electrics for

handling heavy merchandise in the city; the two 2000-pound Commercial electrics for delivering furniture in the city and suburbs; the 4000-pound and the 7000-pound Commercial electric trucks for hauling merchandise from the freight terminals and piers to the store and warehouse; four Ford machines are used for awning, carpet and talking machine department, and

department without delay. Packages and bundles are collected and taken to the delivery room, where they are sorted for the routes. Large merchandise that is bought mainly from sample in the display room, is not taken from the store, the orders being filled from the warehouse, which occupies the five upper stories of the big structure. The goods are taken

on elevators from the warehouses to the main floor, where they are loaded on the trucks, special provision being made to prevent damage.

The delivery service is never permitted to lag, and it is not retarded by accident. The equipment is adequate for any requirement and there is a well equipped repair shop that maintains them in condition to obtain highly efficient service. This shop can handle several machines at one time and the workers are employed day and night as occasion requires to keep the trucks operative. Should a truck become inoperative on the road there is an emergency truck in readiness to replace it, or a repair truck is sent out with the men, tools and parts to make such repair as will make restoration possible.

With every facility and equipment to afford exceptional service, the remaining essential was to find capable and responsible men to operate it, and the judgment of the management in the choice of its executive employees was as carefully based as is any other large detail. Satisfactory results must be obtained, and that the service is well directed the constantly increasing patronage will attest. Only the most efficient drivers are employed and good wages are paid. This insures conscientious and eager workers and establishes the service as highly efficient.

While the service is all that careful observation of the demands of the people and intimate knowledge of their requirements will justify, the possibilities have by no means been reached. The management is keenly alert to anything that will appeal to or benefit its patrons. The purpose is to progress and the best demonstration of this progressiveness is the establishment of a department that from every viewpoint is seldom equaled and not surpassed by any other business of the kind in America. The facilities are adequate for all present needs, but provision has been made for expansion.

THE EVENING BULLETIN, PROVIDENCE, R. I.

**1894**

# OUTLET 22<sup>nd</sup> Young

22 Years Young



**Ribbons**  
50c and 60c a Yard Value.  
Plain taffeta, satin taffeta, organza and fancy taffeta, for hair bows and millinery, all colors. Outlet Cut Price, a yard, 1st Floor, Center.

**19c**

## SERVICE

THAT EXTENDS TO ALL PARTS OF SOUTHERN NEW ENGLAND

- Service in merchandise.
- Service in values.
- Service in economies.
- Service in courtesy.
- Service in delivery.
- Service in maintaining our fixed policy guaranteeing "Always More for Less."



**Women's \$1.25 Guaranteed Silk Stockings**  
(Ask for No. 100)  
Heavy weight pure thread silk, 40s mercerized into the double sole and heel, colored navy, black, white and light leading shades. Reinforcing rib, seamless, and extra fine. Outlet Cut Price, a pair.

**98c**

**Kaysor Italian Silk Fabrics**  
Plain, Golf or Sport Stripes

36 and 60 inches wide. Extra heavy, all silk knitted Italian fabrics for dresses, sport skirts and sweaters. Plain colors are pink, white, blue, old rose, emerald, Belgium or black. Stripes are emerald and white, old rose and white, Belgium and white and black and white. Outlet Cut Price, a yard—

**\$1.98, \$3.49 and \$3.98**

8th Floor, 1st Floor, Center



**Traveling Bags, Trunks and Suit Cases**  
\$1.50 Light Weight Shopping Bags  
Made with good quality 40s green fancy cloth lining, made on strong frame, brass lock and catches, iron handle.  
Size 11 and 12.  
Outlet Cut Price . . .

**98c**

**\$1.50 Fibre Suit Cases**  
Well made with good lining, reinforced, leather, made with strong frame, brass lock and catches, iron handle.  
Size 11 and 12.  
Outlet Cut Price . . .

**98c**

**\$1 Leather Traveling Bags**  
Brown leather with leather linings, inside pockets, brass leather corners, brass lock and catches, iron handle.  
Size 11 and 12.  
Outlet Cut Price . . .

**\$4.98**

**\$15 Reed Body Go-Carts**  
This go-cart has an all-reed body, lined with artificial corduroy; reclining back, woven reed hood top, with full roll on front of same, black enameled gears, rubber-tired wheels and foot brake. The value of this go-cart cannot be equalled elsewhere. Outlet Cut Price . . .

**\$9.98**



Home Talk

**\$5 Children's Outing Sulkies**  
Black enameled frame, reclining back, folding handle bar, deep footwell, four rubber-tired wheels and folding hood top. Covered in artificial leather. A value priced below the wholesale cost. Outlet Cut Price . . .

**\$2.98**

**Red Cross Brand**  
**Silk Floss Mattresses**  
At the Outlet only in Providence  
100% pure

**Women's 39c Union Suits**  
Strictly first quality. Fine ribbed, low neck, sleeveless, lace trimmed or tight knees. Regular and extra sizes. Outlet Cut Price . . .

**29c**

1st Floor, Center

**Fruit Trees**  
Thousands of Apple, Pear and Peach Trees reduced to each . . .

**15c**

**Lawn Seed**  
Central Park White Quail package . . .

**10c**

Seagull package . . .

**20c**

**Nature's Mineral Plant Food or Soil Fertilizer for Lawns and Vegetables**  
A pound bag, for 500 feet . . .

**25c**

25 pound bag, for 2500 feet . . .

**75c**

50 pound bag, for 5000 feet . . .

**\$1.00**

100 pound bag, for 10,000 . . .

**\$1.50**



**\$5 Bicycle Tires—a Pair.**  
Sale Price . . .

**\$2.98**

These tires are guaranteed for the calendar year 1916. Tough, single tubes, made by U. & Tire Co. Only a limited quantity.  
Beverly A. Co., 100 West St., Providence



A Section of an Advertisement of the Manufacturers' Outlet, Showing How the Articles Are Illustrated and Described.

for special service, and the suburban deliveries are made with the 13 Autocars. The service with this equipment is to a zone populated by more than 500,000 people, and while the daily delivery average is more than 4000 packages, more than 6500 have been delivered a day during holiday seasons.

When a purchase is made in the store the sales people are expected to send the package to the delivery

**PACKARD GETS GRAND PRIZE.**

H. H. Hills, sales manager of the Packard Motor Car Company, Detroit, Mich., is very proud of the grand prize and highest award for motor cars and trucks exhibited at the Panama-Pacific International Exposition, which is set up in his office in the centre of a great banner of purple silk and gold.

He also has a letter from O. H. Fernbach, secretary of the International Award Systems, which says in part: "Beg to inform you that the award to the Packard Motor Car Company as adjusted, of grand prize on motor vehicles naturally goes to the merit of the products exhibited. The grand prize does not mean merely a grand prize on the exhibit, but it means a grand prize on motor vehicles, which includes motor cars and trucks."

**OUTING OF RUBBER CLUB.**

The 17th annual outing of the Rubber Club of America was held in Lowell, Mass., on the grounds of the Vesper Country Club, where over 300 members of the organization gathered to enjoy various sports. The rubber industry of the United States was well represented and one manufacturer present hailed from Singapore, India. The committee in charge of the outing was composed of Robert L. Rice of the Hood Rubber Company, Philip E. Young of the Acushnet Process Company, and Francis H. Appleton, Jr., of F. H. Appleton & son.

There were a number of prominent western manufacturers present, including Harvey S. Firestone, who is president of the club; P. W. Litchfield of the Goodyear Company and W. O. Rutherford and C. B. Raymond of the Goodrich company.

**BOSTON ADDS MOTOR APPARATUS.**

The city of Boston before the end of the summer will have installed in its fire department service 85 pieces of motor driven apparatus. The motor equipment already in use is giving very efficient results and motorization of the entire department is being carried out as fast as funds are appropriated. Mayor Curley recently approved an order for \$17,000 for the purchase of four Christie tractors.

**SOUTH BEND BUYS MOTOR TRUCKS.**

The city of South Bend, Ind., has purchased a motor aerial truck and a motor driven combination pump and hose wagon from the South Bend Motor Truck Company of that city.

**DELIVERS 578 TONS IN SEVEN HOURS.**

A five-ton Pierce-Arrow truck used by Richard Fitzpatrick, a New York City contractor, delivered 578 tons of coal in seven hours, exceeding any known previous record for motor truck performance. A total of 114 trips were made over a distance of about a quarter of a mile. Exceptional loading and unloading conditions obtained, of course, to make the record possible. The coal was taken from barges by mechanical conveyors and placed directly into the truck body, which has a power hoist.

**G. M. C. IN ENDURANCE TEST.**

Conspicuous among the 14 entrants in the first commercial car endurance contest held under the regulations and sanction of the American Automobile Association was a 3½-ton G. M. C. truck, which was loaded with 7400 pounds of cement. The contest consisted of a run from Los Angeles to San Diego, in California, a distance of 142 miles and over a route that



Two G. M. C. Trucks That Finished an Endurance Contest on California Highways with Exceptional Scores.

included all types of road surfaces and many steep grades.

Eleven of the entrants finished with perfect scores. Two G. M. C. trucks were entered, the model 15, carrying 1670 pounds, being penalized a few points from an accident. Nevertheless, the vehicle was checked in at every station on time and with time to spare at the finish. The driver was O. V. Burris. The driver of the larger truck was H. E. Heard, both machines being entered by Don Lee, G. M. C. distributor for California.

A similar contest is being planned for an early date.

**HEAVY DUTY WARNER TRAILERS.**

The Warner Manufacturing Company, Beloit, Wis., manufacturer of Warner auto trailers, will put on the market in the near future a series of heavy duty trailers of two, three and five-tons capacity. A. P. Warner has spent over two years in experimental work and will introduce in the product of the company some improved ideas in trailer construction.

## MOTOR FIRE APPARATUS.

### Big Exhibition and Test Will Feature Chiefs; Convention at Providence.

The 44th annual convention of the International Association of Fire Engineers which will open in Providence, R. I., Aug. 29, and continue in session until Sept. 1, will be one of the largest, if not the largest, ever held under the auspices of that organization, both in point of attendance of members as well as incidental activities.

One of the features of the convention will be the big exhibition in the Rhode Island State Armory of motor driven fire fighting apparatus and the all-day pumping contest at the Rhode Island state pier on Allen's avenue, in Providence.

The exhibition of apparatus is the big feature at these conventions, as the organization has its inception through such an exhibition and is still largely maintained for this purpose. The firemen have the opportunity of viewing, inspecting and seeing in operation all the latest fire engines and equipment, and it is expected that in this respect this year's exhibition will be one of the most complete ever shown.



James McFall, Secretary of the International Association of Fire Engineers.

The committee in charge of exhibits is composed of Chief Charles W. Greenfield, chairman, Kearney, N. J.; Chief A. J. Cote, Woonsocket; Chief J. J. Mulcahey, Yonkers, N. Y.; Chief J. E. Buchanan, Winnipeg, Manitoba; Chief George McDorman, Athens, Ga.; Chief Chris O'Brien, Shreveport, La.

The first two days of the convention will be devoted largely to the informal reception of delegates and social activities. On Wednesday the pumping contest will be held and the members will hold a round table talk at the Narragansett hotel in the evening. Thursday will be largely devoted to the Veteran Firemen's organizations, and on Friday, the last day of the convention, the members will take a sail down Narragansett bay to Newport.

The principal topics of discussion are "The Utility of the Triple Combination Pump Hose Wagon and Chemical Engine," "The Fire Department Under a Commission Manager Form of Government," "Does

the Menace of the Wood Shingle Justify Its Abolition," "Self-Contained Oxygen Breathing Mine Rescue and Fire Fighting Apparatus."

In addition to these topics there will be four committee reports, which will be considered and discussed. The subjects and committees are as follows:

"Fire Prevention," Chief Geo. L. Johnson, chairman, Waltham, Mass.; Chief Frank E. Henderson, St. Louis, Mo.; Chief J. Harry Johnson, Indianapolis, Ind.; Chief C. H. Henderson, Bradford, Penn.; Chief Arthur S. Aungst, East Liverpool, O.; Chief Geo. W. Booth, chief engineer, National B. F. U., New York. "Rules to Govern a Standard Test for Theatrical Scenery," Chief H. C. Bunker, chairman, Cincinnati, O.; Chief B. J. McConnell, Buffalo, N. Y.; Chief W. N. Avery, Worcester, Mass.; Chief W. C. Green, Concord, N. H.; Chief Louis Pujol, New Orleans, La.; Chief John C. Egner, Kansas City, Mo.; Chief R. R. Fancher, New Haven, Conn. "To Investigate Ways and Means Whereby Automatic Sprinkler Systems May Be Used to Best Advantage by Fire Departments as Fire Defense Auxiliaries," Chief Howard L. Stanton, chairman, Norwich, Conn.; Chief Frank G. Reynolds, Augusta, Ga.; Chief C. W. Ringer, Minneapolis, Minn.; Chief Aug. Gerstung, Elizabeth, N. J.; Chief John H. Epsey, Elmira, N. Y.; Supt. Salvage Corps J. J. Conway, Cincinnati, O.; T. G. Toomey, chief fire protection, Filene Co., Boston, Mass. "To Consider the Character of Compulsory Requirements for Installation of Automatic Sprinklers," Chief W. H. Daggett, chairman, Springfield, Mass.; Deputy Chief John C. McDonnell, Chicago, Ill.; Chief H. R. Yates, Schenectady, N. Y.; Chief A. B. Ten Eyck, Hamilton, Ontario; Chief Paul J. Moore, Newark, N. J.; Chief Frank E. Thomas, Rockford, Ill.; Supt. Protective Dept. H. R. Williamson, Worcester, Mass.

Owing to the death of Harry L. Marston of Brockton, who was president of the I. A. F. E., Chief T. A. Clancy of Milwaukee, first vice president, has become the active head of the organization and it is expected that he will preside at the meetings.

### MYERS LEAVES TIMKEN-DAVID BROWN.

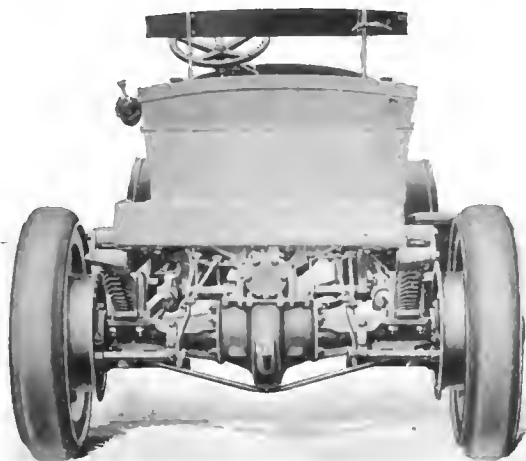
Cornelius T. Myers has sold his interests in the Timken-David Brown Company to the Timken-Detroit Axle Company and has retired as chief engineer and manager of the former company, which has been consolidated under the management of the axle company. He will become a consulting engineer with offices in Detroit.

### STAR MOTOR CAR COMPANY.

A. D. Groves of Ann Arbor, Mich., has been appointed receiver for the Star Motor Car Company, which manufactured a light truck. The receiver will determine whether it is advisable to continue the business or sell it.



**S**ELLING the trucks it builds direct to buyers, instead of through branches or agencies, the sales policy established by the Niles Car and Manufacturing Company, Niles, O., is seemingly revolutionary as applied to distribution. But analysis of the policy evi-



Rear View of Model E Chassis, Showing the Heavy Timken Worm Drive Axle.

dences that its application must necessarily influence every activity of the company, from the plan of operating through production and then so long as its machines are used.

Selling direct to the user or consumer is not new only so far as it relates to the sale of motor trucks, but it is diametrically opposed to the sales methods of practically every concern in the industry. As a policy it has been accepted industrially and commercially as logical. So far as the distribution of trucks is concerned the Niles Car and Manufacturing Company maintains that not only is it intensely practical, but it is based upon factors so clearly established that they cannot be controverted nor denied.

In maintaining this policy the statement of the company is that it builds trucks of exceptional quality because it must establish itself as justifying the fullest confidence of the people generally; that it must fix lower market value for its standards of quality than did these include agents' commissions or expense of branch maintenance; that it must insure absolutely satisfactory service for owners and protect them more fully than would be possible save through the most systematically developed organizations.

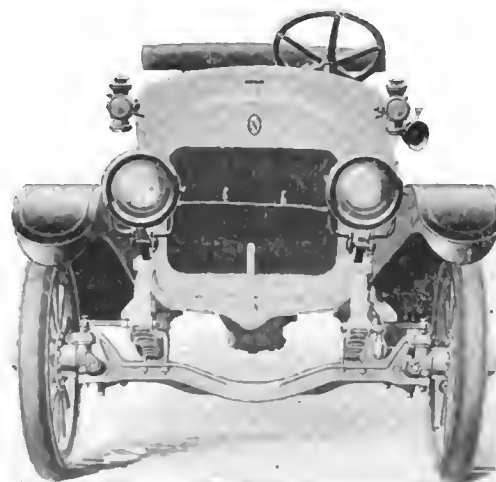
The result of this policy may logically be assumed

to mean the saving to the buyer of Niles trucks of the profit that would obtain were the sale made by an agent or branch. That is, the company can sell at its factory for prices that will afford it a sufficient margin and the purchaser can obtain either a standard quality for smaller expenditures than were the transaction through an intermediary, or higher quality for no greater cost than were the purchase made through agency or branch.

Because of the wide variance in market values there may be supposition that a standard of quality cannot be established, but the Niles company has very carefully developed its plans. It has selected the principal constructional units of its trucks from the products of the best known specialists of the industry. These are accepted without question because they are proven in the minds of all who know automobile vehicles. Not only this, these units have recognized values.

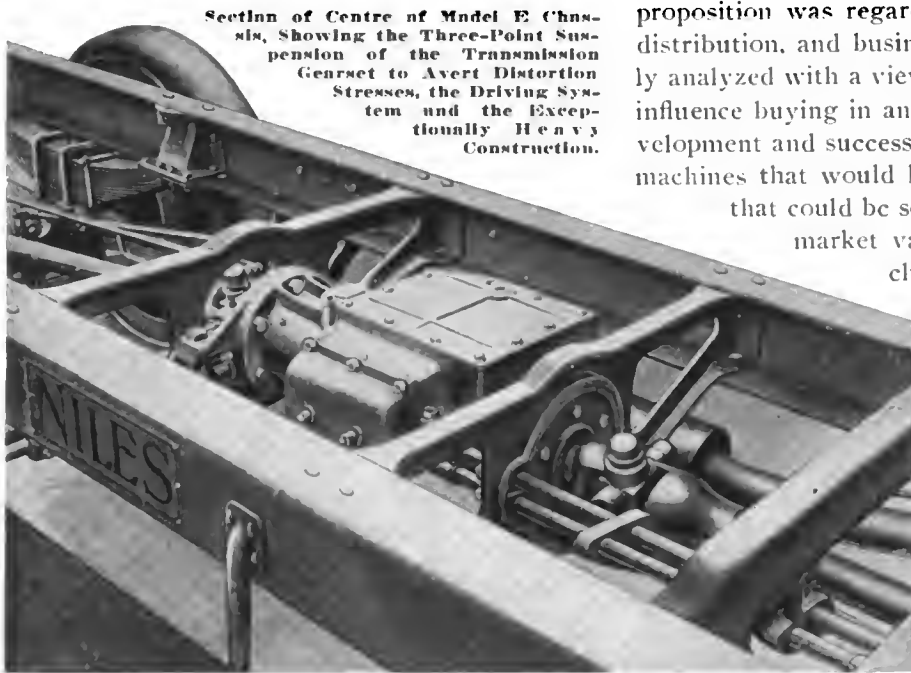
#### Trucks Conventional in Design.

The designs of the trucks are not unconventional, but construction has been studied with extreme care because the purpose has been to obtain machines that are balanced in every sense, so that there might be exceptional endurance in service and high operating efficiency and economy. To attract buyers and appeal to them as a practical and logical business proposition the machines must have undoubted value, because sentiment is lost sight of the world over when service is the main determining factor for purchasing. To justify the guarantee of highest quality the design,



Front End View of Model E Chassis, the Axle Being Extremely Heavy and Fitted with Timken Bearings.





material and workmanship must be proven, first to the manufacturer and then to buyer, and then the factory equipment must be such that the machines can be built to every engineering requirement.

The Niles company was not established to build motor vehicles. It was founded primarily to construct large interurban street railway cars and had been operating on an extensive scale for 15 years, having a plant located in Niles, O., one of the principal manufacturing cities of the Mahoning river valley. The property is located parallel with the tracks of the Erie railroad and consists of nearly four acres of ground on which are five buildings, not including the administration building, that vary slightly in size, but average approximately 60,000 square feet each. This plant was admirably equipped for car manufacturing and its products have been built for and are in use upon many of the best known electric railroads of this country. The company is extremely well and favorably known and its transactions have as a rule been large.

When truck manufacturing was considered the

proposition was regarded from the conventional aspect of distribution, and business methods the vogue were critically analyzed with a view of determining a policy that would influence buying in any market and insure industrial development and success. The belief was that by building machines that would have more than recognized quality,

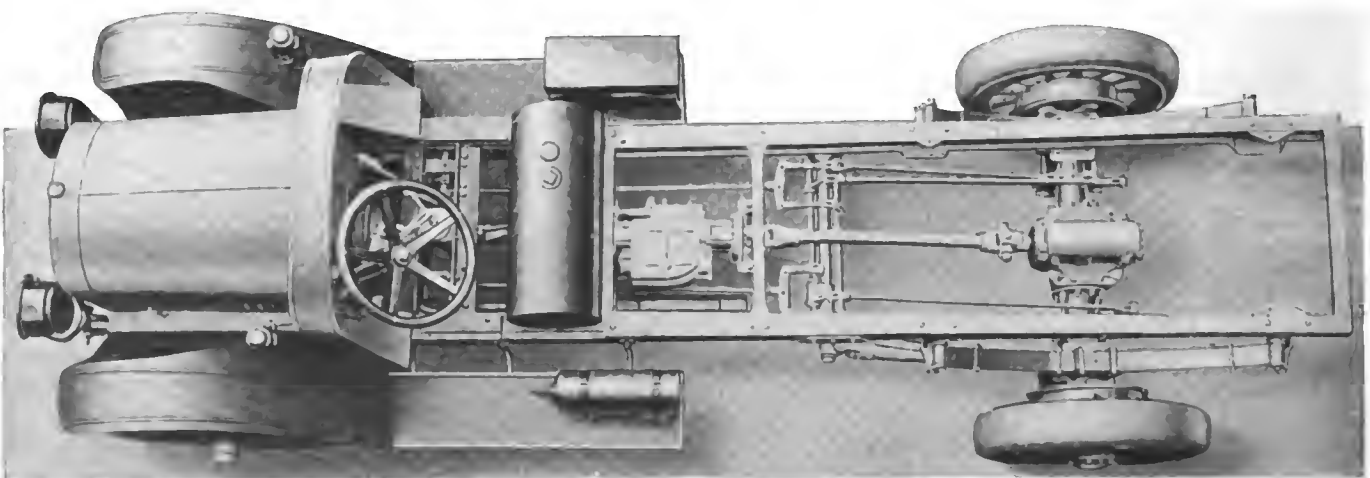
that could be sold for low prices when measured by market values, because these would not include allowance for agency commissions, by concentrated or intensive selling endeavor, and by insurance of service and a guarantee that would be based upon unusual careful design and construction a business of almost unlimited possibilities was assured.

But the plan precluded anything else than an established price for each type of truck. It would not justify discounts nor the acceptance of used trucks

as partial payment for new machines. The statement of the company is that it means absolute maintenance of price, so that every purchaser's dollar has the same purchasing power. Having adopted this policy the company's sales department determined the details by which service could be given, so that each buyer in each zone of operations would be assured satisfactory attention. This plan may be best understood by describing how the company is now operating, the purpose being to extend this as conditions require.

#### How Service Is Assured.

The activities of the company are now in zones contiguous to New York City, Chicago, Pittsburg, Cleveland and Niles, each of these cities being the centre from which a district sales manager directs operations, each of whom is assisted by such salesmen as are necessary. These sales managers supervise the work of the salesmen, and through a systematic advertising campaign by magazine advertisements and mailed literature the selling organization is supported. Prospective purchasers and those engaged in highway



Top View of Model E Chassis, Two-Ton Capacity, Clearly Presenting the Power Transmission System, Rear Spring Suspension and the Brake Linkage and Radius Rods.



**Niles Model E Chassis Equipped with Driver's Cab and Platform Body and Demountable Side Sections, Designed for a Bottler's Service.**

transportation are called on.

Statement is made by the company that its salesmen shall make no claims for overload capacity, nor shall free repairs be made. Every contract for a sale must be submitted to the company's main office for approval. As the guarantee to the purchaser for one year is made by the company, its purpose is to not only make the guarantee clearly understood, but to see that every provision is made relative to service, so that no misunderstanding can arise.

#### **All Dealings Through Company.**

As every truck buyer desires service and wishes to have assurance of this, the company's plan is to afford what will be unquestionably prompt, honest and reliable. Contracts have been made with the concerns in each of the centres of the operating zones that are specialists in motor vehicle repairing to make repairs on Niles trucks. These shops are known for the high class of work done and have the machine and tool equipment and the expert workers to do repairing promptly and carefully. Each of them has a stock of parts which is much larger than the average dealer or agent could afford to carry. As in the original transaction, all of the subsequent dealings, repairs, etc., are direct with the company, so that at all times owner is given a character of attention that assures to him that he is fairly dealt with and is accorded personal consideration.

Since it began operation the company's policy has been regarded by a considerable number of interested inquirers as be-

ing sufficiently elastic to allow discounts from established prices, one very large concern making offer of a contract for 20 trucks if a very nominal discount were made. This, as well as others for smaller numbers of machines, were rejected because the company believes that consistency is absolutely necessary to inspire confidence, and that all customers should be equal, no matter what the proportions of the transaction. The sales made have substantiated the belief of the officials of the company, as these have been far in excess of expectations.

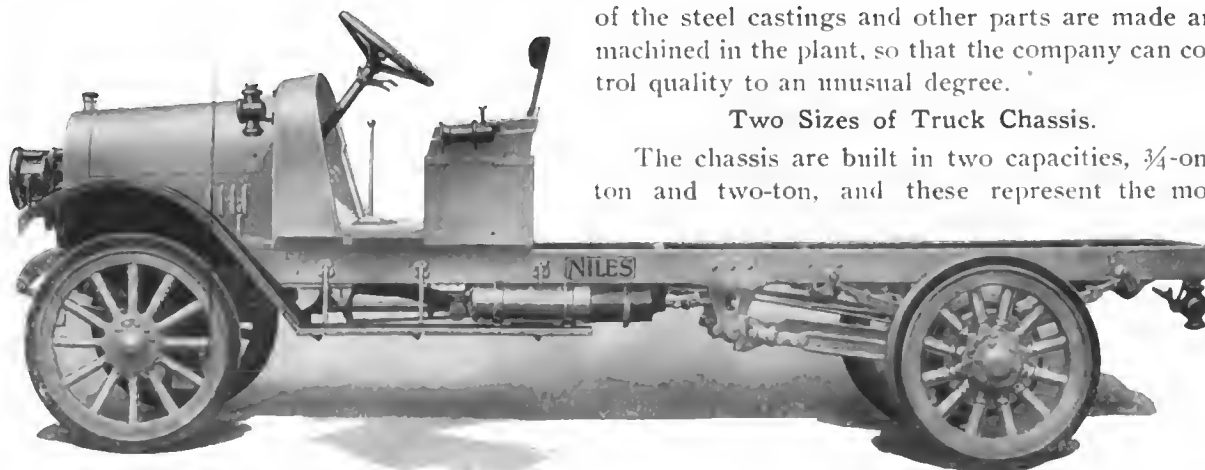
The service representatives of the company are the Orteig Motor Company, West 63d street, New York City; the L. P. Rasmussen Company, Park avenue, Chicago, Ill.; the Lee Randall Company, 6234 Station street, Pittsburg, Penn., and the Malin Motor Company, East 13th street, Cleveland, O., besides the factory organization at Niles. The district sales managers are W. F. Magill in New York City, L. P. Rasmussen in Chicago, N. K. Brown in Pittsburg, E. M. Jones in Cleveland and N. T. Robbins in Niles, while J. A. Stranahan is general representative. M. B. Taylor, Jr., and Harry G. Arthurs are Mr. Robbins' assistants, and each district sales manager has salesmen assisting him.

The officers of the company are as follows: F. T. Robbins, president and general manager; J. A. Hanna, vice president; Charles E. Rose, secretary and treasurer; Elias Lange, manager of the motor truck department and general sales manager; H. H. Hill, chief engineer; Charles E. Trimpe, general superintendent; George C. Moore, superintendent of the body department; J. E. Raftery, purchasing agent.

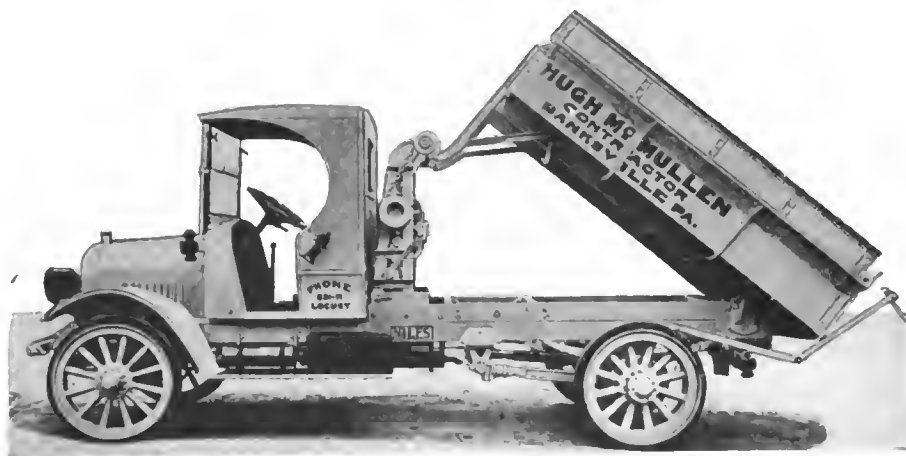
The factory equipment has been chosen with the purpose of obtaining high efficiency and extreme economy of production, operating on a large scale. The installation of jigs is unusually complete, this insuring accuracy and interchangeability and a grade of work that is far above the average. A considerable part of the steel castings and other parts are made and machined in the plant, so that the company can control quality to an unusual degree.

#### **Two Sizes of Truck Chassis.**

The chassis are built in two capacities,  $\frac{3}{4}$ -one-ton and two-ton, and these represent the most



**Side View of Model E Chassis, Showing the Heavy Hangers to Which the Forward Ends of the Radius Rods Are Coupled and the Long, Flat Semi-Elliptic Springs.**



**Niles Model E Chassis Fitted with a Steel Quick-Discharge Body and Power Hoist, Adapted for the Use of a Contracting Firm.**

advanced ideas in motor vehicle practise, simplicity, accessibility, strength and endurance being sought with extreme operating economy and efficiency. The factors of safety are unusually large to insure durability. Because of correct proportions and the locating of the different units the chassis are unusually sightly, and while this is not the guiding thought of the design, it is a natural result of good construction. The units in the chassis are Continental engines, Covert and Borg & Beck clutches, Covert transmission gearsets, Timken worm drive rear and Timken front axles, Gemmer steering gears, Eisemann magnetos, Stromberg carburetors and Pierce governors, and the other components are equally high quality products.

For the purpose of description the model E two-ton chassis will be detailed especially. The model B, three-quarter-one-ton machine differs somewhat from the larger vehicle, but generally the components are smaller in dimensions.

#### **The Model E Two-Ton Chassis.**

The model E chassis is fitted with a model C Continental engine, a four-cylinder, four-cycle, water cooled, L head type with the cylinders cast en bloc, having  $4\frac{1}{8}$  inch bore and stroke of  $5\frac{1}{4}$  inches. This engine is rated at 27.25 horsepower by the S. A. E. formula, but according to the claims of the maker it will deliver from 35 to 40 horsepower when operated at maximum speed. This is a standard type of engine that has been very carefully developed by the manufacturer and is designed to obtain high operating efficiency and

very large fuel economy.

The cylinder block is constructed so that the head is removable by taking out a series of retaining screws. This construction insures uniformity of cylinder walls and water jackets and the complete clearing of the water passages so that there is perfect circulation of the water through the cooling system. There is fullest accessibility to the cylinders for cleaning or repair. The crank case is aluminum alloy and is cast in two sections, the upper being divided by a transverse vertical web that carries the central main bearing. The lower

section is the oil pan. Much care is given to machining and finishing the cylinder block and the pistons, these latter being fitted with three rings each.

The engine has three large main bearings. The crankshaft is a special steel drop forging with the fly-wheel flange integral and flanges at either side of the centre main bearing to take end thrust from any outside influence. The forging is heat treated and carefully ground to size. The camshaft is a three-bearing type and it is hardened and formed with extreme care to insure accuracy of the cams. The connecting rods are I section drop forgings that are heat treated and are finished on special machine tools to obtain absolute accuracy. The connecting rod caps are shimmed and are retained by nickel steel bolts. The main, connecting rod and camshaft bearings are highest grade nickel babbitt.

The valves are nickel steel heads electrically welded to carbon steel stems, with hardened ends to resist wear. The valve tappets are a mushroom type and are fitted with adjusting screws and nuts. Both the valves and the tappets are operated in guides that may be renewed when worn. The valve mechanism is covered



**Niles Model E Truck with Driver's Cab and Exceptionally Large Express Body with Standing Top Utilized for Hauling Bulky Loads, Which Are Fully Protected.**



Niles Model E Chassis with Driver's Cab and Standard Type of Open Express Body.

with steel plates that are quickly removable and afford fullest protection. All the timing gears are helical and are cut on automatic hobbing machines, particular care being taken to obtain accurate maintenance of gear centres. These gears are practically noiseless.

#### Cooling and Lubricating Systems.

The engine is cooled by water that is circulated through the water jackets and a Fedders honeycomb truck type radiator by a large centrifugal pump. The cooling system is generous and radiation is promoted by a fan mounted on an adjustable bracket driven by a flat belt from a pulley on the water pump shaft. The radiator is mounted on a flat frame cross member on a cork pad. This installation insures against the straining of the radiator from the weight of the content or from chassis distortion, as the support is beneath it, and it is very largely relieved of vibratory stresses. The radiator can be removed very quickly in the event of damage.

The lubrication system is a combination of splash and force feed, a double vertical plunger pump, driven by eccentrics from the camshaft, forcing the oil through copper tube to two sight feed indicators on the dash and thence to the rear main bearing and the timing gear. The oil drains to the troughs in the oil pan and thence is distributed by splash to all moving parts, there being a constant level in the troughs. The excess oil drains to the reservoir, where it is filtered and again circulated. The oil screen and pump may be easily removed for cleaning. There is a gauge that indicates the quantity of oil in the reservoir.

The ignition current is supplied by an Eisemann high-tension water proof magneto that is extremely simple, there being but four wire leads to the spark plugs, which are carried in a conduit, and one wire to the switch and ground. The switch may be locked in "off" position, which will insure against unauthorized use of the truck. The carburetor is a model K-2 Stromberg, an automatic float feed type with straight tube, which has no movable parts, and after adjustment at the factory requires no further attention. This will afford a satisfactory mixture of fuel at all operating speeds. The throttle is controlled by a hand lever on the steering wheel and by an accelerator pedal.

There is a choke valve for starting when the engine is cold.

The engine and clutch are independent of the transmission gearset and are suspended at three points in the chassis, so that there are no distortion strains upon it. The clutch is a large Borg & Beck dry plate construction that is adjustable for wear of the discs. It is controlled by a rocker shaft connected to the foot pedal, there being a rocker arm mounted against a ball thrust bearing. A large bronze bearing in the clutch housing carries a splined shaft on the outside and a ball bearing supports the shaft in the flywheel. The clutch is connected to the transmission shaft by a short driving shaft in which are two Blood Brothers universal joints. These joints have large bearing surfaces and abundant provision for lubrication.

#### The Power Transmission System.

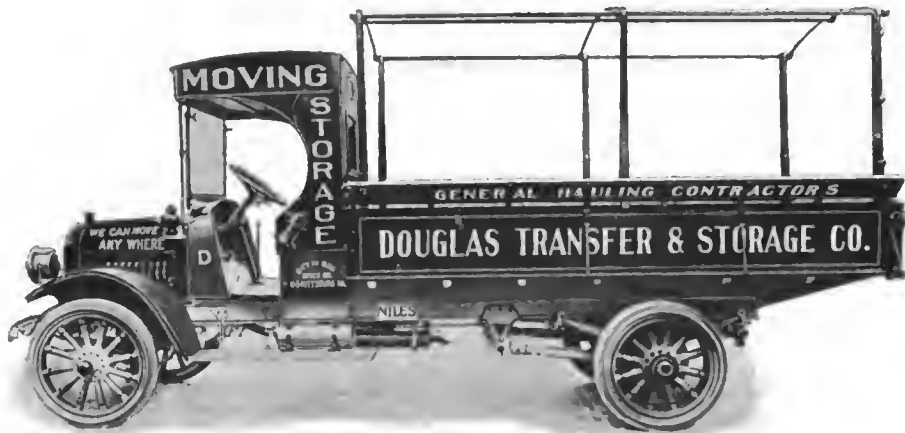
The transmission gearset is a very heavy Covert construction, a selective sliding gear type having three forward speed ratios and reverse. The gears are carried in a large casing and are mounted on high duty Hyatt roller bearings. The shift rods are locked in different positions by pins in the gearbox and the gear shift lever is so constructed that when in neutral position both shift bars are locked. The gearset case is mounted in the frame in a perfect three-point bearing. The rear end is carried on a heavy cross member and is bolted to the bracket on the frame by two bolts. At the front end is a large flange with a spherical periphery, which rests in a seat formed in a cross frame member in which it is free to turn or have a slight telescoping movement. This construction prevents any weaving movement of the frame, being sustained by the case, and as the gearbox is constructed to resist the stresses of the shafts and gears, it need not be rigidly mounted. This support has been developed to prevent frame stresses upon the power transmission system and insure against misalignment.

The gearset is coupled to the worm shaft of the Timken rear axle by a short solid shaft with telescopic joint, which has a Blood Brothers universal joint at either end. This rear axle is the full-floating type, the housing of which carries the load, the wheels turning

on two heavy Timken roller bearings at each end. The power is transmitted by the worm shaft and wheel to driving shafts, the inner ends of which are splined and



Niles Model B Chassis Equipped with Driver's Cab and Open Express Body with Flareboards for General Haulage.

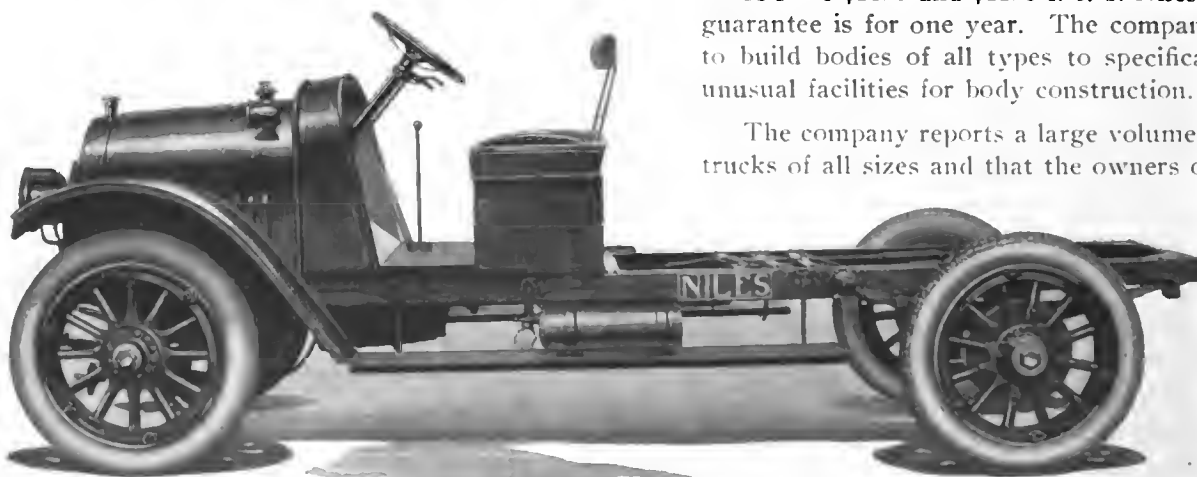


**Niles Model E Chassis with Driver's Cab and Large Flareboard Express Body Fitted with a Frame to Support a Removable Waterproof Cover, Designed for Furniture Moving.**

are carried in the differential gears, the plates at the outer ends being bolted to the wheels. The axle is constructed of high class material throughout, is built with great accuracy, is proportioned to have extreme endurance and strength, and it is constantly lubricated from a bath of oil carried in the differential housing. The cover plate of the central housing carries the differential assembly as a unit, which is easily removable. Lubrication is provided through a filler in the rear of the axle housing.

#### General Chassis Details.

The front axle is Timken, an I section steel drop forging that has extra heavy steering knuckles, the wheel spindles being fitted with Timken roller bearings. The frame is pressed steel channel section, of large proportions, with wide webs, that is drilled and hot riveted, there being reinforcement by generous gusset plates. This is suspended on semi-elliptic alloy steel springs proportioned to carry all loads and protect the axle. These springs are long and wide and fitted with large bronze bushings and hardened and ground bolts, with means for sufficient lubrication. The relation of the rear axle is maintained by radius rods that are non-adjustable as to length, but have bronze bushed universal joints at either end to obtain free movement of the axle. The springs carry



**Side View of Niles Model B Chassis with Driver's Seat, Showing the Hotchkiss System of Driving Through the Forward Ends of the Rear Springs.**

the load and resist the axle torque.

The wheels are wood, artillery type, 36 inch, fitted with four-inch tires forward and seven-inch tires at the rear. The wheelbase is 140 inches and the tread 58½ inches forward and 60 inches rear. The steering gear is a Gemmer worm and wheel type column, with 20-inch hand wheel, and the linkage is a fore-and-aft construction with large ball joints and heavy tie rod. The steering gear is adjustable to compensate for wear. The control is by foot pedals for the clutch and service brake and a foot accelerator and hand levers for the

ignition and fuel supply. The emergency brake lever and gear shift lever are in the centre of the foot-board. The driver's seat is at the left side. The brakes are large size and are both internal expanding within drums on the rear wheels.

Much care is taken to make the parts enduring, these being heat treated, hardened and ground where wear requires. The fuel tank is 20 gallons capacity and is located under the driver's seat. The chassis weight is 4750 pounds.

The chassis equipment includes driver's seat, front fenders, gas head lamps and old dash and tail lamps, "instant liters," reduction valve and size B Prest-O-Lite tank, license plate brackets, tool box, kit of tools, jack, horn and oil can and holder.

The model "B" truck is equipped with a unit power plant that is cooled by thermo-syphon circulation and Covert dry plate clutch, and it has Hotchkiss drive—through the rear springs instead of radius rods. The wheels are equipped with 36 by five-inch pneumatic tires. The chassis weight is 2875 pounds.

The engines are fitted with Pierce governors that give a maximum 15 and 25 miles respectively to the model "E" and model "B" chassis. The prices for the chassis are \$1875 and \$1175 f. o. b. Niles. The chassis guarantee is for one year. The company is prepared to build bodies of all types to specifications, having unusual facilities for body construction.

The company reports a large volume of sales of its trucks of all sizes and that the owners of the vehicles

are generally very enthusiastic over their performance and operating efficiency, wherever they are used.



## TOUR ON EAST MICHIGAN PIKE.

### Federal 1½ Ton Truck Accompanies Pleasure Cars on Long Hike.

A party of over 100 members of the Detroit Board of Commerce Good Roads Committee and good roads advocates made a tour over 400 miles of the East Michigan pike during the middle of last month in the interests of the good roads movement. This pike, which runs from Toledo, O., through Detroit, Pontiac, Flint, Saginaw, Bay City, Alpena to Mackinaw City, where it runs into the West Michigan pike, is an extension of the Dixie Highway.

The party travelled in 20 automobiles with a Federal 1½-ton truck as a baggage carrier. Stops were made to hold meetings to stimulate enthusiasm for good roads.

The Federal truck carried the baggage for all the tourists and 600 pounds iron as ballast, but despite poor roads in many sections maintained the same time schedule as the pleasure cars, arriving at the end of the route only 10 minutes behind the pacemaker. It was equipped with a regulation army body and tarpaulin top. No adjustment was made on the truck during the trip.

The Goods Roads Committee of the Detroit Board of Commerce, which is fostering the movement for completing the East Michigan pike, is arousing interest in the project so that the farmers will build the roads that they are entitled to under the state reward act. The members of this committee are:

William E. Metzger, chairman, member of the Good Roads Committee of the National Automobile Chamber of Commerce; Roy D. Chapin, president of the Hudson Motor Car Company; J. Walter Drake, president of the Hupp Motor Car Company; Alvan Macauley, president of the Packard Motor Car Company; S. D. Waldon of the Cadillac Motor Car Company. Edward N. Hines, chairman of the Wayne County Road Commission; W. C. Rands, president of the Rands Manufacturing Company; W. G. Bryant, attorney. D. C. Starkweather, Detroit representative of the Buick Motor Car Company and president of the Detroit Automobile Dealers' Association; M. L. Pulcher, vice president and general manager of the Federal Motor Truck Company; Edwin S. George and George W. Cushing, advertising manager of the Federal Motor Truck Company.

### NASH MOTORS, INCORPORATED.

The Nash Motors Company has been incorporated with a Maryland charter to take over the business of the Thomas B. Jeffery Company of Kenosha, Wis., which was recently purchased by Lee, Higginson & Co., of Boston, and Charles W. Nash, formerly president of the General Motors Company.

The new company has a capitalization of \$5,000,000 preferred stock and 50,000 shares of common stock of no par value. The Thomas B. Jeffery Com-

pany was one of the most prosperous truck concerns in the industry and for the fiscal year ending June 3 earned net profits of \$2,000,000. During the 14 years that the company had been doing business an average profit of \$522,000 has been made annually.

### TO REOPEN GOLDEN WEST MOTORS PLANT.

The newly elected officers of the Golden West Motors Company, Sacramento, Cal., are planning to reopen the plant to turn out 2600 trucks for which orders have been received. The new officers are all San Francisco capitalists. C. W. Hornick is president. The offices of the concern will be established in San Francisco.

### INCREASE IN REDDEN CO. CAPITAL.

The Redden Motor Truck Company, which manufactures the Redden-Truck Maker, which is a unit for converting a Ford or other light pleasure car into a serviceable one-ton truck, has recapitalized for \$500,-



The Federal Trucks That Carried the Luggage of the Tourists Who Examined the Highways of Michigan.

000 to provide for a further expansion in the company's business.

C. F. Redden, formerly general sales manager of the Maxwell Motor Company, is head of the Redden Motor Truck Company and he has associated with him a large number of men who are well known in the manufacturing as well as financial end of the automobile industry.

### FIRE AT ATTERBURY PLANT.

The plant of the Atterbury Motor Car Company of Buffalo, N. Y., was damaged to the extent of \$50,000 by fire the evening of July 25. Twenty-five trucks in the assembly room were destroyed. The part of the plant in which the fire took place will be rebuilt.

### U. S. MOTOR TRUCK COMPANY MEETING.

At the annual meeting of the stockholders of the United States Motor Truck Company of Cincinnati, O., it was voted to increase the capital stock of the company from \$300,000 to \$1,000,000. The new stock is

divided into common and preferred, the latter being cumulative seven per cent. stock, sharing in the earnings with the common up to 10 per cent.

A large amount of the new stock was subscribed for by stockholders at the meeting and part of the remaining stock will be offered to the public. A regular annual dividend of seven per cent. on the preferred stock was authorized by the directors and a large sum was placed to the credit of the surplus.

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#### CARDWAY GOING TO SOUTH AMERICA.

Fred Cardway, who has become associated with the Packard Motor Car Company, Detroit, Mich., will leave for South America early in September to establish agencies for the Packard Twin-Six cars and the Packard chainless trucks. He will take with him one or more of both types of machines, together with an expert driver and mechanic. Whenever it is possible it is planned to take the "Packard Caravan" overland.

Mr. Cardway, who speaks a number of languages, has been prominently interested in promoting business intercourse between this and foreign nations, both in Europe and America.

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#### CORMAN WITH DENMO TRUCK.

E. W. Corman, formerly with the Elgin Motor Car Corporation, and at one time associated with the Saxon Motor Car Company, has been appointed sales and advertising manager of the Denneen Motor Company of Cleveland, O., maker of Denmo trucks.

Mr. Corman has had many years experience in the automobile industry and is well known in the trade. The Denmo model 10, which is designed to carry a load of 1¼ tons, is the first type turned out at the factory and is a completely equipped internal gear driven truck. It has an electric starting and lighting system, the use of which is made possible by a patented spring suspended battery cradle.

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#### DONALDSON WITH HOME OFFICE.

Paul B. Donaldson has become a special field representative for General Sales Manager H. T. Boulden of the Chase Motor Truck Company, Syracuse, N. Y. Mr. Donaldson, who is now a member of the home office organization of the company, was formerly connected with the Philadelphia branch.

It is understood that a new model of the Chase will be announced in the near future, to be known as model "X," with a capacity of three tons, which will sell for \$2800 equipped with a cab.

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#### WILL BUILD FARM TRACTORS.

The Hessian Rotary Tiller and Tractor Company of Detroit will manufacture a farm tractor, the design

of Dr. E. R. Pendleton of Westfield, Mass. Work is under way on the machines, which have to be produced under the laws of the State of Michigan before the acts of incorporation for the new company can be obtained.

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#### REPUBLIC TRUCKS IN FRANCE.

Cecil Hamelin Taylor, consulting engineer on the staff of the Republic Motor Truck Company, is on a tour of investigation in France and England in connection with his aeronautical work. Mr. Taylor, who is also on the engineering staff of the Curtis Aeroplane Company, will devote much of his attention to the development of the aeroplane motor and will also confer with foreign engineers on motor truck development in the war, as the Republic company now has 2000 machines in service in Europe.

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#### FRAUD ORDER AGAINST I. A. L. INC.

The Postoffice Department at Washington has issued a fraud order against the International Automobile League, Inc., of Buffalo, N. Y., denying the organization the use of United States mails. The order was also effective against the Automobile League Tire Company of the same city and A. C. Bidwell, president of both organizations.

The attention of the Postoffice Department was called to the operations of these concerns by the Associated Advertising Club of the World and the American Automobile Association. It is claimed that Bidwell made a fortune through the operations of these concerns.

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#### HOWARD WITH DENMO TRUCK.

S. B. Howard, formerly eastern and foreign representative of the General Motors Company, has been appointed New England sales manager of the Denneen Motor Company of Cleveland, O., manufacturer of the Denmo line of trucks. Edward P. Strang, formerly with the Kirk-Katty Manufacturing Company of Cleveland, has been appointed middle western sales manager for the Denneen company.

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#### "PREPAREDNESS AND MOTOR TRUCKS."

The August number of "Like Kelly Does," published by the Kelly-Springfield Motor Truck Company, Springfield, O., contains a very interesting and valuable article entitled, "Preparedness and Motor Trucks." It gives a careful analysis of the war transportation methods with results showing a high percentage in favor of the motor truck as compared with the mule or horse.

# The MOTOR TRUCK

*Devoted to Motor Driven Business  
Vehicles of all Classes*

Pawtucket, R.I.

Vol. VII. No. 9.

SEPTEMBER, 1916.

## EXCAVATE WITH TRUCKS 25 FEET BELOW GRADE.

**World's Largest Construction Company, Erecting Mammoth Pennsylvania Hotel in New York City, Does Foundation Work with Steam Shovels, Planked Surface, Inclines and Power Hoists Until Rock and Tunnels Are Reached.**

**E**CONOMIES are sought by every large enterprise, no matter what the character, and the degree of economy obtained by each may be measured by the magnitudes of the works engaged in. By this is meant that the greater the success the more evident are the endeavors to conserve time, labor and material. There may be many ways of stating economy. For instance, it may be broadly efficiency, or it may be referred to as increased production with no added facilities, or again it may be improved equipment, or better systematization, or changed methods, or reorganization, but in every instance the intended result is to obtain more for the same cost—for cost is the basis of all determinations—or the same result for a lessened cost.

There is no reason to believe that economies can be obtained by rule, because conditions are never uniform, and generally speaking, each undertaking is di-

rected by those whose endeavors must be governed by their resources and experience. The principal reason for invention is necessity, and while invention is usually understood to be the creation of a mechanical substitute for labor, a process for doing a work, a perfection of a tool, machine or device, or practically ap-

plying an idea, the word may logically be applied to the adaptation of existing utilities to new work.

Inventions, by the intent of the patent laws, can be directly controlled by the inventors or owners for a period of years, but the invention of a new use for machines, tools, apparatus, equipment or



Steam Shovel in Pit for Foundation for Pennsylvania Hotel, New York City, and Mack Truck Loaded with Stone Handled with the Derrick.

facilities of any kind can only be an exclusive advantage so long as it may be kept from public knowledge. All are free to use such inventions, which are valuable in ratio to the economies resulting from them, but because no monetary value can be or is placed upon these economies, and they are generally stated in com-

parative terms only, the people as a whole are unwilling, or at least hesitate, to imitate or adapt them.

The same ratio of economy cannot be obtained with such use of facilities, because conditions for operating differ very broadly, but there is no reason why,

employees, aside from laborers, are carefully educated to its system and these men are placed on the work for the purpose of obtaining every economy of time and labor that is practically possible. When conditions arise that are unusual it has experts available who are qualified to deal with them, and these men may be regarded as the strategists of construction, who can economize as well as utilize equipment or devise special facilities for meeting a situation.

The Pennsylvania hotel is being erected by the Pennsylvania railroad at Seventh avenue and 32nd and 33rd streets, in New York City, and when completed it will be the largest hotel in the world. It is to be operated in conjunction with the railroad, just as the Hotel Biltmore is now operated in New York City by the New York Central railroad, and as is planned for the Terminal hotel that is projected for the Grand Central terminal in the Metropolis. This will be the last work in the completion of the Pennsylvania system so far as New York City is concerned, and it will be in keep-



Foot of the West Incline and the Plank Road in the Bottom of the Excavation of the Pennsylvania Hotel, at Seventh Avenue and 32nd and 33rd Streets, Showing Magnitude of the Work.

with the engineering knowledge that is available to all who desire it, work cannot be carefully studied and extremely practical methods devised for utilizing equipment that had not before been regarded as practical.

#### New Uses for Motor Trucks.

From the viewpoint of the power vehicle industry invention may not be applied to the use of trucks, and yet there is every reason why this term should be used to express the means by which the George A. Fuller Company, the largest construction company in America, and probably in the world, which has offices in 12 cities and frequently has operations progressing simultaneously in many different places, has practically operated trucks and tractors in constructing the Pennsylvania hotel in New York City.

The Fuller company is a contracting engineer. It will undertake work anywhere, but naturally seeks contracts that are large and which it has the organization and the equipment to carry out. It has not the same character of competition that is met by smaller contractors, but its contracts are necessarily limited in number because its specialization is erecting buildings of extreme height or covering large areas. The company does all its work scientifically. Practically every detail of construction is an engineering problem and is worked out with extreme care. Its

ing with the magnitude and character of the magnificent plan of development that included tunnelling the bed of the Hudson river and the erection of the great station, so that passengers may enter or depart from the centre of the city instead of from terminals in Jersey City and Hoboken.

This building will be a wonderful structure from every point of view. The site is 400 feet long and 236 feet wide and on this is to be erected an edifice that will have three stories below the street level and 24 above it, having a total floor area of approximately 2,500,000 square feet, or 58 acres. Were the second sub-basement the full size of the site the hotel would have 58 acres and 21,920 square feet of floor space, but as the lowest floor will be partly taken up by the crests of the Pennsylvania and Long Island railroad tunnels that are under it, and on which the structure will be erected, the area will be very close to the 58 acres. The hotel will have 2200 rooms for guests, as well as every conceivable provision for their convenience and comfort. The cost of the building will be in round figures \$6,000,000, and this does not include the value of the site, and the furnishings will cost \$3,000,000. Probably the hotel when it is open will represent an investment in excess of \$12,000,000.

**Must Be Completed Sept. 1, 1917.**

The statement that the structure will be wonder-

ful was not intended to apply to the floor area, the cost, the character of the furnishings or the luxuriance of the hostelry, for while these are worthy of special attention, there is another phase that will probably cause very general surprise, and that is that although the work on the excavation was begun May 22 of this year, the building must be completed by the contractors Sept. 1, 1917. As the actual building of the foundation is not expected to be begun until Oct. 15, one will realize that the construction must be carried on with extreme rapidity, and that it must continue without interruption through the coming winter.

The site was covered with a considerable number of buildings that were very largely stores with tenements above them, and these were allowed to remain and be productive until the railroad company had matured its plans and awarded the contract. But in the construction of the tunnels the erection of the building had been anticipated and provided for. The foundation was to be 40 feet below the street level wherever possible, and on the tunnel structures, about 25 feet below, wherever necessary. The tunnels were in rock for the greater part of their depth, but above them the filling was what is known as loose material. The site is 400 feet in both 32nd and 33rd streets, and 236 feet in Seventh avenue, and the tunnels were separate at Seventh avenue and converge toward the eastern end, resembling lines of the neck of a wine bottle.

When the tenements were demolished the cellars were more or less filled with debris, which was removed, but below the cellar lines there was approximately 100,000 cubic yards of earth and rock to be excavated, and this was the work that was begun May 22, the cut to be made to the depth of the tops of the tunnels and elsewhere to 40 feet. In some places the rock was close to the cellar line, but the greatest depth of the earth was about 25 feet, so that between the tunnels and on either side was a great deal of rock. The only manner of removing this was by blasting, which must be done cautiously for fear of damaging the tunnels. The tunnels are constructed largely of concrete, with three-foot steel girders imbedded in the tops, so that they can support the immense weight that will be built upon them.

Real estate is more expensive in New York City than anywhere in the world, if one wishes to buy it. Seemingly it is even more difficult to dispose of when one has excavation work, and the Fuller company had

to take out 100,000 cubic yards of earth and rock and carry it away. There are not many places in the city where filling is desirable and these are seldom near to building operations. In some instances haulage contractors can sell some of the earth excavated, but not frequently as a rule. Rock is rarely sought for filling. What is the most general means of disposal is to haul the excavated material to a pier, dump the carts or trucks into scows and tow these outside the harbor and unload them by discharging through bottom traps. There are contractors who provide scows and tugs for this work and some of them have pier privileges. This method of disposing of the material is probably cheaper than hauling it long distances, for the cost of the drivers and carts is very expensive when the time lost working in traffic congested streets is considered.

#### Jacob Fradus' Bid for Haulage.

The Fuller company sought to make contract for the removal of the material excavated and among those who made bid for the work was Jacob Fradus, a haulage contractor, who was then engaged in similar work for the United States Realty and Improvement Company and Holbrook, Cabot & Rounds, both operating subway contracts.

The two subway sections these concerns are constructing are in Broadway, that of the United States Realty and Improvement Company from 28th to 38th streets, and that of Holbrook, Cabot & Rounds from



The West Incline from the Bottom of the Excavation to 32nd Street, Built on the Grade of the Original Cellars and Extended as the Work Progressed.

38th street to 51st street. The work that Fradus is engaged in is simply removing the excavated material to places where filling is required or to piers, where it is placed in scows. He had been a haulage contractor for years until the destruction of the Equit-



able building in New York City by fire, when he made contract to wreck the ruins, and his first large work was the contract for hauling the material excavated from the Broadway subway, operations on the section from 28th to 38th streets being begun in December, 1914, and on the 38th-51st street section Sept. 1, 1915.

When the work was begun on the subway it was continuous from 12 o'clock Sunday night to 12 o'clock Saturday night of each week, the operations ceasing Sundays only. The condition necessitated quick loading in the streets because nothing that would obstruct traffic or inconvenience the people was tolerated by the police. Horses could not be used practically, as the number of carts adequate to haul the material would cause much street congestion. Fradus decided to use trucks and purchased a number of Mack ma-

pounds, which were hoisted from the cars on the industrial railroads in the cutting, and the skips were hauled on the trailers and emptied by hoisting with a derrick and tripping them when over the scows at the pier. The loads of the trucks were approximately seven cubic yards, the loads of the tractors were tonnage rather than yardage. The loose material was hauled on cars in the cut, hoisted to shaft houses and dumped into bins and the trucks were loaded by gravity discharge from the bins through chutes.

This very briefly describes the manner of working the trucks and tractors in removing the earth and rock from the subway. The work on the 28th-38th street section was continuous save Sunday, but because of the interpretation of a statute the laborers could be worked only eight hours a day, and this necessitated a change, so that the men worked two shifts of eight hours each, starting at 6 a. m. and 2:30 p. m., with a half hour for lunch. The haulage was done while the shifts were working, so that the cutting was "cleaned up" by the crew at work.

This haulage of material was all in congested streets, the best part of the day, so far as freedom from traffic was concerned, being lost. The trucks were equipped with power hoists and with the derricks at the piers for unloading the trailers comparatively little time was lost. When he had 14 machines working on the 28th-38th street section of the subway Fradus had bought these without knowledge of the future and he had approximately two years' work for them.

The earnings were based on

writing off the entire cost in the period and making a substantial profit. Comparison could not be made with animal haulage, although a few teams were used from time to time, but after providing for every charge the machines were credited with a profit of \$10 a day for the trucks and practically double that for the trailers.

#### How to Use Trucks in Excavation.

The experience with the trucks and trailers in the subway work was such that Fradus was a bidder for the removal of the material from the Pennsylvania hotel excavation. The Fuller company realized that the excavation was to be costly because of the depth of the work and the character of the material to be removed, and while there was no doubt of the possibilities with the trucks and trailers could they be loaded



Mack Truck, 7½ Tons Capacity, with Load of Stone, Being Drawn Up the West Incline, the Two Men Behind Holding the Timber Chock to Guard Against Accident Should a Cable Break.

chines of 7½ tons capacity, and later a number of Mack tractors, which were used with semi-trailers, these having capacity from 12 to 15 tons. In all 14 machines, 11 of 7½ tons capacity and three tractors, were used on the 28th-38th street section, two of these being rented. When the second contract was engaged in five more 7½-ton trucks and four more tractors and semi-trailers were bought. This made the total equipment 14 trucks and seven tractors, and of these 12 trucks were used on the 28th-38th street section, and the seven tractors and two trucks on the other work.

#### Parallel Work of Subway Haulage.

The work on the subway was excavating loose material and rock. The stone was blasted and broken so it could be handled in steel skips, each weighing 3380

quickly, the problem was how to load them with the least loss of time. The company's engineers studied the conditions and consulted with Fradus.

Loading the trucks without rehandling was first of all desired. This could be done with steam shovels that could be moved about the excavation. By laying plank roadways in sections, that could be quickly changed when necessary, the trucks could be moved about with certain traction. With these facilities planned raising the trucks from the excavation when loaded and lowering them unloaded was worked out. By building a trestle from the street with a drop of one foot in five, which could be extended as the excavating progressed, the trucks could be hoisted or lowered by a power winch. The Fuller company was willing to provide the equipment and the contract was entered into.

From 32nd street, which terminates at Seventh avenue, and which has not the through traffic that uses 33rd street, two inclines to the bottom of the cellar line of the tenements were built. These were designed to be supported by the earth so long as possible, and to be extended as the depth increased. Under these were installed two double-drum winches that were driven by large electric motors, the power being taken from convenient supply mains. Wire cables with large hooks were run from each winch drum of sufficient length to haul the trucks 200 feet. At the top of each incline was a platform from which the trucks could be started by their own power. The spring horns of the trucks were fitted with large eyebolts to take the cable hooks, and the plan was to have each truck hauled up or lowered down by two cables, so that in the event of a cable breaking the machines could be held secure.

The plan was not to use the power of the trucks on the inclines, but to hoist them at a reasonable speed, and to guard against accident a section of timber six inches square was equipped with a rope at either end and these ropes were run through braces outside the end gates. When a truck was to be hoisted two men, each holding a rope end and with the timber swinging just clear of the deck of the incline, followed it up prepared to drop the timber to chock the wheels should a cable break.

#### Load Trucks with Steam Shovels.

Starting at the cellar line two steam shovels, one of three-quarters cubic yard and the other of  $1\frac{1}{4}$  cubic

yards capacity, were set at work. As the plank roads were laid from the inclines to the steam shovels the trucks could be worked rapidly, and a regular headway was maintained so long as the shovels were worked. The trucks have a capacity of approximately seven yards of loose material and with the ground cleared of obstructions so that the shovels could be used to capacity the time required for loading was comparatively brief. While not comparable with gravity loading, the material was handled but once. This was the big economy. Hoisting and lowering the trucks required but very little time and there were no delays.

The discharging was done direct into the scows at the pier at 30th street and the North river, and to give some idea of the expense of disposing of the ma-



The Top of the West Incline with Mack Tractor and Trailer Loaded with 17 Tons of Stone Being Hauled Up by the Electric Winch Winding a Cable.

terial statement may be made that Fradus pays \$1.20 a load of seven yards to have the scows towed down the harbor and dumped. This is a contract that he enters into. His profit must be made after the payment of his operating cost, overhead and the dumping expense. When the work was begun two shifts of eight hours each were employed, but later this was changed so that but one 10-hour shift was worked. The round trip for a truck is about  $1\frac{1}{2}$  miles and the time was approximately 25 minutes. From 12 to 15 trips could be made in eight hours, depending upon the work of the steam shovels. As an example of the work in one day nine trucks hauled out 525 cubic yards of rock and dirt. The earth yardage removed during these days was rather more than half the ex-

cavating capacity of the steam shovels.

#### **Tunnels and Rock Reached.**

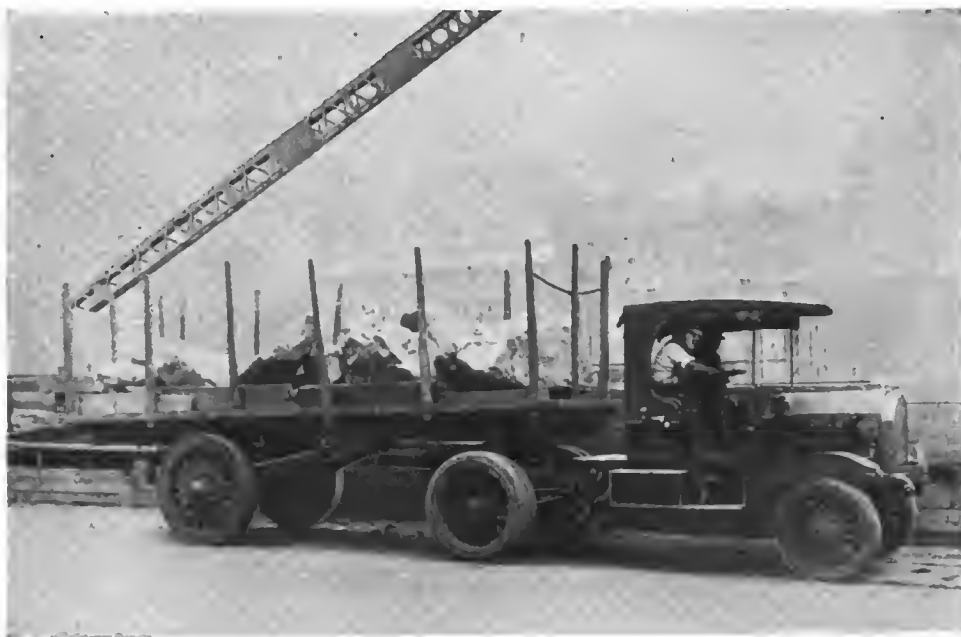
As the excavating progressed no more time was required for loading the trucks. A few horse teams were used for "cleaning up" and three-horse hitch teams were used for hauling the carts about in the soft surface, and occasionally a lift was given a truck if it was run off the plank roads. The plank road was found to be a decided economy of tires, for it could be kept clear of objects that might cause damage to them. When the depth of 25 feet was reached the concrete crests of the tunnels were uncovered and in these were gradations of height that were from 12 to 18 inches from which descent was made to the rock by grading of from six to eight per cent., up which the trucks could be driven, or, if necessary, were helped by the three-horse hitch teams. This made really two main lifts, the one from the rock and the other to the street.

After the tunnels had been reached and the loose

one in use. The tractors and trailers were used in the excavation with excellent results, although the loading required more time, and loads weighing 15 tons were hoisted up the incline with ease. When earth only was worked as many as 24 trips were made by trucks in a 16-hour shift. Incidentally, the horse carts were hoisted out of the excavation, the horses walking up the inclines with the cable hitched to the poles.

Jacob Fradus has 11 trucks working at the Pennsylvania hotel, and with his subway contracts he has 32 machines in service, seven of which are tractors. The rock is hauled longer distances than the earth, some of the stone being taken to Long Island City and there loaded on freight cars for shipment elsewhere. This means the cost of rock haulage is considerably increased, but as this is desired for a special purpose and is an unusual disposal of excavated material, this is apart from the work for which contract has been made. The trailers make four of these Long Island City trips a day.

The Fradus trucks are garaged at 351-5 West 52nd street, where the mechanical work is directed by a foreman mechanic who has five or six men under him. Here are kept spare wheels and tires and a large stock of parts, so that unless for very extensive repairs the business is independent of service stations, although the International Motor Company, builder of Mack trucks, has its New York plant a comparatively short distance away. The success of Fradus in contract haulage can best be judged from the fact that his first truck was delivered Dec. 1, 1914. He now has perhaps 10 teams of horses that are



One of the Tractors and Trailer with 17-Ton Load of Stone, Used in the Excavation Work, Starting for Long Island City, a Trip Made Four Times Daily.

earth removed from above them, blasting the rock was necessary. The trucks could not then be worked advantageously in the excavation because the steam shovels could not be used and handling the rock by hand caused too great delay to use the trucks. Accordingly derricks were erected on the 32nd street side and bins were built above the street with chutes for discharging into the trucks and trailers. The rock is hoisted to these bins in comparatively small pieces and the trucks are loaded without delay of any kind. Horse teams are used in the bottoms for collecting the stone and getting it to the derrick buckets, and laborers handled the stone in very large part. Small blasts are necessary because of the possibility of damaging the tunnel structures.

#### **Rock Removed by Other Means.**

After the work was begun on the rock one incline was removed and the illustrations were made with but

worked on small contracts or rented to other contractors.

Comparisons showing actual dollars and cents cannot be made because horses cannot be used for practically all of the work done, but the possibilities are very large, and they are increasing with experience. Mr. Fradus says that one of the important factors for success in his work is standardizing on equipment, and getting machines that will endure in service.

#### **ESSEX COMPANY TO BUILD FACTORY.**

The Essex Motor Truck Company of New York is planning a new factory building to be erected at Flushing, L. I. The structure will be one story in height with a saw-toothed roof. The main offices of the company are being moved from 299 Madison avenue in New York City to 1649 Broadway.

## S. A. E. PROPOSES STANDARD VEHICLE TEST.

**A**T A meeting of the research division of standards committee of the Society of Automobile Engineers, held in Detroit, Aug. 25-26, a number of well known members of the society were present and gave their views on tests for gasoline economy, car capacity and other kindred subjects.

A combination test for car performance was decided upon to be tentatively recommended. This test will include both fuel economy and acceleration, the whole to be done without carburetor adjustment or any change in gear ratio or other details of car. The test will be in charge of a referee. A series of 10-mile runs at various speeds on a speedway or other approved course for determining gasoline economy, and several acceleration runs with an electrical device to record the time at short intervals during acceleration will be held.

If the standards committee accepts the plan the division will ask its approval subject to a further report by the division after the actual tests are made.

At a meeting of the lamp sub-division of the electrical equipment division recommendations were formulated for quite a number of details of bulb and lamp construction. This meeting was held at Cleveland, O., Aug. 24. On Aug. 20 the electrical equipment division met in New York City and tentatively approved the following recommendations for submission to the standards committee. Before being finally adopted the proposals will be tried out under manufacturing conditions.

**Bulbs**—The centre of the filament is to be located in the axis of the bulb,  $1\frac{1}{4}$  inches from the nearer or locating side of the locating pins of the base.

**Vacuum bulbs** are to have filaments in the form of a helix 4.2 mm. long and 2.5 mm. in diameter.

**Gas filled bulbs** are to have filaments in the form of a V (each leg of the B being formed of a fine helix) 3 mm. wide at the base and 2.5 mm. in length. The plane of the filament is to be at 90 degrees from the plane of the locating pins.

**Specifications for sizes and efficiencies of bulbs used in automobile lamps**, also for labelling reflectors, are to be repealed.

**Reflectors**—Parabolic reflectors of  $1\frac{1}{4}$  inches focal length are recommended; the lamps to have concentric bulb receptacles located in the reflectors so that at the central point of adjustment the side of the bayonet slot where the locating pins in the bulb case come to rest shall be  $1\frac{1}{4}$  inches from the focal point of the reflector.

**Other Subjects**—Standardization of three-inch tail lamp glasses is recommended, with tolerances of minus  $\frac{1}{64}$  and plugs  $\frac{1}{32}$  inch.

The feasibility and expense of manufacturing bulbs with filaments located so accurately that bulbs may be replaced in head lamps without the necessity of refocussing, will be investigated. This may result in the elimination of focussing devices from head lamps, except possibly a provision for initial focussing in manufacture.

The sub-division having in charge plans for standardizing mountings of starting motors, electric generators, ignition distributors, storage battery terminals and storage battery dimensions, will take up their work this month and meetings will also be held by the Aeronautic Engine division.

### MOTOR TRUCK CLUB OUTING.

The fifth annual outing of the Motor Truck Club of America was held on Wednesday, Sept. 13, at Glenwood Landing, Long Island. The event was attended by a large number of the members, their families and friends, all of whom enjoyed an interesting programme of sports, including a baseball game and swimming and dancing contests.

The committee that arranged the outing was composed of the following: Roderick Stephens, ex-officio; Willard S. Mears, chairman; T. A. Aspswell, A. C. Bergmann, Charles G. Bond, F. Nelson Carle, Hayward P. Carvarly, C. M. Geiger, Robert Hunt, Jr., Joseph Husson, Henry K. Jaburg, George H. Logan, Joseph K. Orr, W. Oscar Shadbolt, C. Monroe Smith and A. G. Taylor.

### TRUCK FAMINE IN CHICAGO.

In anticipation of the railroad strike which was threatened prior to the passage of the Adamson eight-hour act by Congress, the demand for trucks in Chicago was so great conditions bordered on a famine. Milk dealers, garden truck producers and others who ship from the suburbs to the city daily were the principal purchasers of trucks and practically cleaned up the stock on hand.



Fleets of One-Ton Republic Trucks Purchased by the Quartermaster-General's Department of the United States Army for the Use of the Signal Corps in Mexico. A Large Number of Republic Machines Have Been Bought by This Department for Service Requirements.

## TRACTORS FOR ARMY SERVICE.

### Government Buys 27 Machines After Battles by British in France.

Attacks made by British forces upon German lines in France with machines that were referred to as "tanks" and which were described as being heavily armed with machine guns and armored so that they were practically invulnerable to machine gun and rifle fire, attracted much attention and no end of speculation because of the fact that they were driven over the rough battlefields with as great mobility and as certain control as though on a smooth highway.

Nothing of the kind had ever been used in warfare and the appearance of the machines in battle was a surprise to the German soldiery that was quite beyond their resources to meet, for despite the heaviest fire the machines continued on toward them and were not



Holt Caterpillar Tractor, a Type Used by the British Army in Recent Battles in France, and Which Will Be Used by the United States for Haulage of Heavy Artillery.

in the slightest retarded by what were believed to be certain obstacles to any vehicles.

Within a very short time, however, the public was told that these new weapons were armed and armored Holt tractors, built by the Holt Manufacturing Company of Peoria, Ill., a caterpillar type, of 120 horsepower. The company has sold about 1000 of these machines to the British government, and while primarily intended to haul artillery or very heavy vehicles, arming and protecting them against rifle, machine gun and even the lightest artillery fire was a very natural result.

The adaptation of the tractors for attack was unknown until they were sent into the battle, and they were proven to be remarkably effective weapons. The detail of adapting them is, of course, not known. The accompanying illustration is of a Holt caterpillar trac-

tor, but not as large as those used by the British army.

A few days after the publication of new stories of the use of "tanks" by the English forces the United States government, through its quartermaster general's department, purchased 27 Holt tractors, to be delivered in 90 days, which will be utilized for the haulage of heavy artillery for coast and other defence. Statement is made that the purpose is to organize artillery regiments that will be armed with guns of 9½ inches caliber or larger, and that experiment with guns up to 16-inch caliber will be made. Movement of the guns and the ammunition for them will be by tractor trains and other motorized equipment.

### GRAMM-BERNSTEIN REORGANIZES.

The Gramm-Bernstein Motor Truck Company has been incorporated under the laws of Ohio with capitalization of \$4,000,000—\$3,000,000 common and \$1,000,000 preferred stock—to take over the business and assets of the Gramm-Bernstein Company of Lima, O. The par value of both classes of stock is \$10 per share.

B. A. Gramm, the inventor founder of the business, who holds a number of patents for construction exclusively used in the manufacture of Gramm-Bernstein trucks, will continue as vice president of the company and Mr. Bernstein as president and treasurer. H. O. Bentley remains as secretary and legal counsel and R. H. Spear as director of sales. Two eastern men financially interested in the concern are members of the board of the directors, together with Messrs. Gramm, Bernstein and Bentley.

The shares of the company will be offered for sale to the public through Walston H. Brown & Bro., brokers, of New York City, and it is expected that the shares will shortly be listed on the New York Stock Exchange.

Additional capital was required to meet the rapidly expanding business of the concern, which has grown phenomenally in the past two years. A large export business has also been built up. To obtain the additional production new factory buildings will be erected.

### LOW REPAIR COST ON PIERCE-ARROW.

A five-ton Pierce-Arrow truck which has been in use by the Harvard Brewing Company of Boston, Mass., for 14 months, during which time it has been run over 7541 miles and carried 2290 tons, has incurred repair costs of only \$66.89.



## MOTOR FIRE APPARATUS AT CHIEFS' CONVENTION.

**F**ROM the viewpoint of the members of the International Association of Fire Chiefs, which organization held its annual convention in Providence, R. I., the week beginning Aug. 28, the largest and best display of fire apparatus and equipment ever seen in America was on exhibition at the State Armory in that city. While there are innumerable com-

turned or handled in a comparatively narrow street. The full length of the apparatus, which carries a three-section 75-foot ladder, is 41 feet, which is maintained by the maker to be the shortest motor aerial ladder truck built. This truck is the first of the kind produced and it is to be delivered to the New York City fire department.



**Trial of Ahrens-Fox Triple Combination Pumping Engine for Pumpage at State Pier.**

munities where animal equipment is used wholly or in part, yet every apparatus shown was motorized, although there were units intended for the conversion of horse apparatuses that are serviceable, these being regarded as being as equally desirable for cities and towns that are economical as are the latest and largest capacity equipment.

The most remarkable fact in connection with the exhibition was the careful study made by the chiefs of the different exhibits. The displays were made by manufacturers from all parts of the country as far West as the Mississippi river, and while some of them were limited, this was largely due to the lack of floor space. The applicants had obtained all the available exhibition space months prior to the show, and while many who would have made exhibit were compelled to abandon their purpose, others sought to make the most of the show by having apparatus in the streets about the armory, where it might be demonstrated under power. In the opinion of those who carefully observed the exhibition had twice the space been available it would all have been taken, and this in turn would undoubtedly have attracted a still greater attendance.

### Great Interest in the Exhibits.

While there was naturally great interest manifested by the fire chiefs in the show, there were committees and delegations from city governments from numerous cities in the East whose members sought to obtain from personal examination and observation of the exhibits a better knowledge than could be acquired from interviews and inspection of one or several types, and there was seemingly a desire to know what would best serve rather than to accept proffers to bids as being all that the industry might afford.

In addition to the showing of distinctly fire apparatus there were adaptations suited for differing service made by the manufacturers and representatives of pleasure cars, some of which were capably designed and equipped. One of the novelties of the exhibition was shown outside of the State Armory, and this was a Christie tractor coupled to a new type aerial ladder built by the Combination Ladder Company of Providence. This ladder has the special advantage of short length, so that it may be

Besides the short truck the ladder is claimed to have numerous other advantages, included among these being the possibility of raising it in exceptionally quick time and that there is no necessity of supporting the truck by jacks or other means to insure a secure base for the ladder to be turned.

The convention was attended by upwards of 1200 delegates, aside from others who were attracted by the exhibit of apparatus, and there were sessions at which subjects were presented and discussed, as well as a "Round Table" talk at which different topics were suggested and

considered. These sessions were of special interest to the members of the organization. The possibility of a railroad strike that might cause delay and personal inconvenience was the reason for the change of the convention plans and some of the delegates living long distances from New England left before the conclusion of the sessions.

So great is the confidence of the fire chiefs in motorized apparatus that there was no desire to discuss practicality or methods of maintenance or repair. There was belief that automobile machines are so well understood and are so reliable that they are taken for the full value placed upon them, but there is so much improvement in detail that there is good reason for keeping pace with the industry. The keen interest of manufacturers of trucks and fire apparatus was manifested in the presence of engineers who gave critical attention to all the exhibits with the purpose of learning every detail of design and construction of the machines built by others.

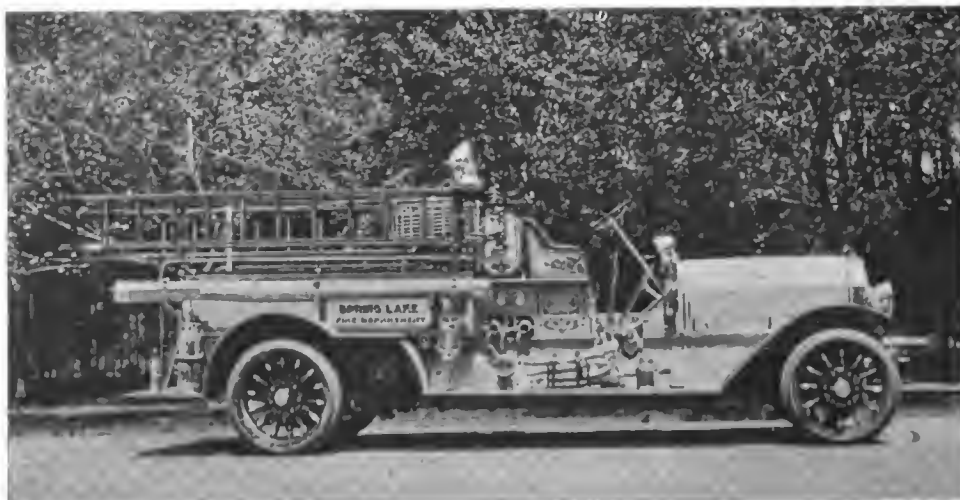
There was another aspect as well. Many manufacturers of accessories found the convention and the exhibition logical places to learn the relative merits of their productions as compared with those of competitors, for they have learned that the patronage of the municipalities is worth consideration and the cities and towns are consistent buyers and their accounts are especially desirable.

### Some of the Largest Exhibitors.

The largest exhibitor of motor driven fire fighting apparatus was the American La France Fire Engine Company of Elmira, N. Y., which exhibited almost every type of equipment



**New Type Aerial Ladder Truck, Claimed to Be the Shortest Built, Designed for the New York City Fire Department.**



Seagrave Combination Fire Pump and Hose Wagon, Built for the Spring Lake Department.



Thomas A. Clancy, Milwaukee, Wis., President of National Association of Fire Engineers, 1916-17.

in the 11 different machines it had on the floor. The Seagrave Company of Columbus, O., exhibited four machines, including a cutaway chassis, showing the sectional operation of the water pump. Two fire engine chassis were shown by the White Motor Company of Cleveland, O. The South Bend Motor Car Company of South Bend, Ind., had on exhibition a type 4 chemical and hose wagon and also a city service truck, Model C-S.

Considerable interest was shown in the exhibit of the Robinson Fire Apparatus Company of St. Louis, Mo., because of the "Robinson Lilliputian" triple combination pumping engine, which was installed on a Ford chassis and was equipped with practically all the fire fighting appurtenances that are found on machines costing much larger investments, only that these were on a smaller scale. This concern also exhibited a "Greyhound" twin triplex piston pumping engine and a Robinson "Whale" combination engine with a 400-gallon junior pump. Other exhibitors who showed motor driven apparatus were the New England Truck Company of Fitchburg, Mass., the Ahrens-Fox Fire Engine Company of Cincinnati, O., and a Brockway Type A, 50 horsepower combination engine and a Mack hose wagon were shown by agents.

#### Clancy Elected President.

Thomas A. Clancy, chief of the fire department of the city of Milwaukee, was elected president of the association at the annual election of officers which was held during the convention. The other officers elected were: Chief A. A. Rozetta of Nashville, Tenn., first vice president; Chief John Kenlon of

New York City, second vice president; James McFall, fire chief of Roanoke, Va., secretary, and Chief George Knofflock, Mansfield, O., treasurer. The last mentioned two were re-elected.

Jacksonville, Fla., was chosen as the convention city for the 1917 meeting of the association.

The most interesting, if not the most important, feature of the convention was the tests of automobile pumping engines held at the state pier on Aug. 30 under the direction of the committee on exhibits of the association, with the assistance of engineers of the National Board of Fire Underwriters and of the New England Insurance Exchange.

These tests are held annually and are regarded as being the best demonstrations of apparatus capacity that can be engaged in. They are open to all manufacturers.

#### The Pumping Test of Engines.

There were five machines entered in the tests, which continued for 12 hours, six hours delivering at 120 pounds net pressure, three hours delivering at 200 pounds pressure and three hours delivering at 250 pounds net pressure, the quantities determined by the preliminary test. No more than two men were allowed to operate or care for the engines at any one time. All the machines were supplied with gasoline from a tank truck of the Texas Company, which was stationed on the dock for the purpose.

The specifications and rated capacity of the trucks that were in the test, together with the results, are as follows:

#### Ahrens-Fox.

Maker's name, Ahrens-Fox Fire Engine Company.

Manufacturer's number, 820.

Rated capacity, 120 pounds pressure, 900 gallons; 200 pounds pressure, 500 gallons; 250 pounds pressure, 400 gallons.

Type, M2, pump and hose wagon.

Weight without men or hose, 11,530 pounds; on rear wheels, 5,940 pounds.

Tire type, solid; size, 36x5 in. front; 36x4 in. dual rear.

Tread, 66 in. front; 85 in. outside rear.

Wheelbase, 171 in.

Engine, own make, 6-cylinder, 5½-in. bore, 7 in. stroke, 72.6 horsepower, A. L. A. M. formula.

Gear ratio, engine to pump, 3.437 to 1.

Type of drive to pump, spur gear and pinion.

Pump type, multiple piston, 4 cylinders, double acting.

Bore, 4 in. and 4¾ in.; stroke, 6 in.

Displacement per revolution, minor, 1.2594 gallons; major, 1.5158 gallons; total, 2.7752 gallons.

Gasoline tanks, number, 1; capacity, 35 gallons; gravity feed.

Height of centre of suction above ground, 48 in.

First test—Duration, 6 hours.

Layout of hose and nozzles, 2 lines, 2¼-in. hose, 100 and 100 ft.; 2-in. tip. Average nozzle pressure, 61.4 pounds.



Delegates to the Fire Chiefs' Convention Witnessing the Engine Tests Made at the State Pier, Providence.

Average discharge, 931 gallons.  
Average net pump pressure, 132 pounds.  
Engine speed, R.P.M., 1168.  
Pump speed, R.P.M., 340.

Actual displacement per revolution, 2.741 gallons.

Suction lift, 10 ft. 6 in. to 14 ft. 6 in.  
Remarks: None.  
Second test—Duration, 3 hours.  
Layout of hose and nozzles, 1 line, 2½-in. hose, 200 ft.; 1½-in. tip.

Average nozzle pressure, 82.5 pounds.  
Average discharge, 509 gallons.  
Average net pump pressure, 216 pounds.  
Engine speed, R.P.M., 1245.  
Pump speed, R.P.M., 362.

Actual displacement per revolution, 1.405 gallons.

Suction lift, 14 ft. 6 in. to 15 ft. 6 in.  
Remarks: At 3:20 vibration of hose resulted in a burst length next the engine. Shut down for 5 minutes to replace this length of hose.

Third test—Duration, 3 hours.  
Layout of hose and nozzles, 1 line, 2½-in. hose, 300 ft.; 1½-in. tip.

Average nozzle pressure, 120.9 pounds.  
Average discharge, 411 gallons.  
Average net pump pressure, 271 pounds.  
Engine speed, R.P.M., 1153.  
Pump speed, R.P.M., 336.

Actual displacement per revolution, 1.223 gallons.

Suction lift, 12 ft. 6 in. to 14 ft. 6 in.  
Gasoline used, 112 gallons.  
General remarks: Small leak in air dome permitted air to escape and caused considerable vibration of hose during most of the run.

#### American-La France.

Maker's name, American-La France Fire Engine Co., Inc.

Manufacturer's number, 1237.  
Rated capacity, 120 pounds pressure, 1000 gallons; 200 pounds pressure, 500 gallons; 250 pounds pressure, 400 gallons.

Type 12, combined pump, chemical and hose wagon.

Weight, without men and hose, 9940 pounds; on rear wheels, 5790 pounds.

Tire type, Dayton airless; size, 38x4½ in. front 38x4½ in. dual rear.

Tread, 62 in. front; 71 in. outside rear. Wheelbase, 161 in.

Engine, own make, 6-cylinder, 5½ in. bore, 6 in. stroke, 72.6 horsepower, A. L. A. M. formula.

Gear ratio, engine to pump, 2.66 to 1 and 4.65 to 1.

Type of drive to pump, spur gear.  
Pump type, rotary gear

Displacement per revolution, 2.35 gallons.

Gasoline tanks, number, 1; capacity, 30 gallons; gravity feed.

Height of centre of suction above ground, 33 in.

First test—Duration, 6 hours.

Layout of hose and nozzles, 3 lines, 2½-in. hose, 100, 200 and 300 ft.; 2-in. tip.

Average nozzle pressure, 72.2 pounds.  
Average discharge, 1010 gallons.

Average net pump pressure, 131 pounds.  
Engine speed, R.P.M., 1302.

Pump speed, R.P.M., 490.  
Actual displacement per revolution, 2.061 gallons.

Suction lift, 9 ft. 3 in. to 13 ft. 3 in.

Remarks: None.  
Second Test—Duration, 3 hours.

Layout of hose and nozzles, 1 line, 2½-in. hose, 200 ft. 1½-in. tip.

Average nozzle pressure, 85.0 pounds.  
Average discharge, 516 gallons.

Average net pump pressure, 221 pounds.  
Engine speed, R.P.M., 1311.

Pump speed, R.P.M., 282.  
Actual displacement per revolution, 1.829 gallons.

Suction lift, 13 ft. 3 in. to 14 ft. 3 in.

Remarks: None.  
Third test—Duration, 3 hours.

Layout of hose and nozzles, 1 line, 2½-in. hose, 300 ft.; 1½-in. tip.

Average nozzle pressure, 128.0 pounds.  
Average discharge, 423 gallons.

Average net pump pressure, 261 pounds.  
Engine speed, R.P.M., 1193.

Pump speed, R.P.M., 256.

Actual displacement per revolution, 1.652 gallons.

Suction lift, 11 ft. 3 in. to 13 ft. 3 in.  
Remarks: None.

Gasoline used, 165 gallons.

#### American-La France.

Maker's name, American-La France Fire Engine Co., Inc.

Manufacturer's number, 1234.

Rated capacity, 120 pounds pressure, 900 gallons; 200 pounds pressure, 450 gallons; 400 pounds pressure, 400 gallons.

Type 12, combined pump, chemical and hose wagon.

Weight without men or hose, 10,920 pounds; on rear wheels, 6200 pounds.

Tire type, Dayton airless. Size, 38x4½ in. front; 38x4½ in. dual rear.

Tread, 62 in. front; 71 in. outside rear. Wheelbase, 173 in.

Engine, own make, 6-cylinder, 5½-in. bore, 6-in. stroke, 72.6 horsepower, A. L. A. M. formula.

Gear ratio, engine to pump, 3.07 to 1.

Type of drive to pump, bevel and spur gear.

Pump type, dual multiple piston pump, 4 cylinders, double acting, bore 4 in. stroke 6 in., displacement per revolution, right side, 1.259 gallons; left side, 1.259 gallons; total, 2.518 gallons.

Gasoline tanks, number, 1; capacity, 33 gallons; gravity feed.

Height of centre of suction above ground, 30 in.

First test—Duration, 6 hours.

Layout of hose and nozzles, 3 lines, 2½-in. hose, 200, 250 and 300 ft.; 2-in. tip.

Average nozzle pressure, 61.6 pounds.  
Average discharge, 933 gallons.

Average net pump pressure, 133 pounds.  
Engine speed, R.P.M., 1193.

Pump speed, R.P.M., 389.  
Actual displacement per revolution, 2.398 gallons.

Suction lift, 9 ft. 3 in. to 13 ft. 3 in.

Remarks: None.  
Second test—Duration, 3 hours.

Layout of hose and nozzles, 1 line, 2½-in. hose, 200 ft.; 1½ in. tip.

Average nozzle pressure, 99.3 pounds.  
Average discharge, 460 gallons.

Average net pump pressure, 221 pounds.  
Engine speed, R.P.M., 1223.

Pump speed, R.P.M., 398.  
Actual displacement per revolution, 1.156 gallons.

Suction lift, 13 ft. 3 in. to 14 ft. 3 in.

Remarks: None.  
Third test—Duration, 3 hours.

Layout of hose and nozzles, 1 line, 2½-in. hose, 300 ft.; 1½ in. tip.

Average nozzle pressure, 122.4 pounds.  
Average discharge, 414 gallons.

Average net pump pressure, 261 pounds.  
Engine speed, R.P.M., 1120.

Pump speed, R.P.M., 365.  
Actual displacement per revolution, 1.134 gallons.

Suction lift, 11 ft. 3 in. to 13 ft. 3 in.

Remarks: None.  
Gasoline used: 135 gallons.

#### American-La France.

Maker's name, American-La France Fire Engine Co., Inc.

Manufacturer's number, 1233.

Rated capacity, 120 pounds pressure, 850 gallons; 200 pounds pressure, 500 gallons; 250 pounds pressure, 350 gallons.

Type, combined pump, chemical and hose wagon.

Weight without men or hose, 9520 pounds; on rear wheels, 5520 pounds.

Tire type, Dayton airless. Size, 38x4½ in. front; 38x4½ in. dual rear.

Tread, 62 in. front; 71 in. outside rear. Wheelbase, 161 in.

Engine, own make, 6-cylinder, 5½-in. bore, 6-in. stroke, 72.6 horsepower, A. L. A. M. formula.

Gear ratio, engine to pump, 1 to 1.5.

Type of drive to pump, spur gear.

Pump type, 4-stage centrifugal, 11-in. impellers.

Gasoline tanks, number, 1; capacity, 30 gallons; gravity feed.

Height of centre of suction above ground, 33 in.

First test—Duration, 6 hours.

Layout of hose and nozzles, 3 lines, 2½-in. hose, 100, 100 and 350 ft. 1½-in. tip.

Average nozzle pressure, 88.5 pounds.  
Average discharge, 856 gallons.

Average net pump pressure, 130 pounds.  
Engine speed, R.P.M., 1123.

Pump speed, R.P.M., 1684.  
Actual displacement per revolution, 0.508 gallons.

Suction lift, 9 ft. 3 in. to 13 ft. 3 in.

Remarks: None.  
Second test—Duration, 3 hours.

Layout of hose and nozzles, 1 line, 2½-in. hose, 200 ft.; 1½-in. tip.

Average nozzle pressure, 81.4 pounds.  
Average discharge, 505 gallons.

Average net pump pressure, 218 pounds.  
Engine speed, R.P.M., 1225.

Pump speed, R.P.M., 1838.  
Actual displacement per revolution, 0.274 gallons.

Suction lift, 13 ft. 3 in. to 14 ft. 3 in.

Remarks: None.  
Third test—Duration, 3 hours.

Layout of hose and nozzles, 1 line, 2½-in. hose, 350 ft.; 1-in. tip.

Average nozzle pressure, 144.4 pounds.  
Average discharge, 355 gallons.

Average net pump pressure, 266 pounds.  
Engine speed, R.P.M., 1315.

Pump speed, R.P.M., 1972.  
Actual displacement per revolution, 0.180 gallons.

Suction lift, 11 ft. 3 in. to 13 ft. 3 in.

Remarks: None.  
Gasoline used, 155 gallons.

#### Seagrave.

Makers' name, the Seagrave Company.

Manufacturer's number, 15,060.

Rated capacity, 120 pounds pressure, 750 gallons; 200 pounds pressure, 500 gallons; 250 pounds pressure, 350 gallons.

Type, model T, pump and hose wagon.

Weight without men or hose, 11,930 pounds; on rear wheels, 6240 pounds.

Tire type, solid; size, 36x5 in. front; 38x4 in. dual rear.

Tread, 62 in.  
Wheelbase, 172 in.

Engine, own make, 6-cylinder, 5¾-in. bore, 6½-in. stroke, 79.3 horsepower, A. L. A. M. rating.

Gear ratio, engine to pump, 1 to 2.06.

Type of drive to pump, spur gear.  
Pump type, 4-stage centrifugal, 10-in. impellers.

Gasoline tanks, number, 1; capacity, 40 gallons; gravity feed.

Height of centre of suction above ground, 27 in.

First test—Duration, 6 hours.

Layout of hose and nozzles, 2 lines, 2½-in. hose, 150 and 300 ft.; 2-in. tip.

Average nozzle pressure, 44.0 pounds.  
Average discharge, 788 gallons.

Average net pump pressure, 138 pounds.  
Engine speed, R.P.M., 997.

Pump speed, R.P.M., 2054.  
Actual displacement per revolution, 0.384 gallons.

Suction lift, 8 ft. 9 in. to 12 ft. 9 in.

Remarks: None.  
Second test—Duration, 3 hours.

Layout of hose and nozzles, 1 line, 2½-in. hose, 300 ft.; 1½-in. tip.

Average nozzle pressure, 64.1 pounds.  
Average discharge, 534 gallons.

Average net pump pressure, 211 pounds.  
Engine speed, R.P.M., 1152.

Pump speed, R.P.M., 2373.  
Actual displacement per revolution, 0.225 gallons.

Suction lift, 12 ft. 9 in. to 13 ft. 9 in.

Remarks: None.  
Third test: Duration, 3 hours.

Layout of hose and nozzles, 1 line, 2½-in. hose, 300 ft.; 1-in. tip.

Average nozzle pressure, 144.6 pounds.  
Average discharge, 355 gallons.

Average net pump pressure, 258 pounds.  
Engine speed, R.P.M., 1260.

Pump speed, R.P.M., 2596.  
Actual displacement per revolution, 0.137 gallons.

Suction lift, 10 ft. 9 in. to 12 ft. 9 in.

Remarks: None.  
Gasoline used, 173 gallons.

## F-W-D TRUCKS IN MEXICO.

### More Than 120 Machines Used by Army in Operations Along the Border.

More than 120 F-W-D trucks are in the service of the United States army stationed along the Mexican border or the expeditionary force now near Casas Grandes, being used by the quartermaster general's department or attached to the different commands. A considerable number are utilized for carrying supplies between Columbus, N. M., and Casas Grandes and the others are attached to different commands.

Some machines are equipped with bodies of the type standardized for "escort" duty, while others have tanks that will carry 600 gallons of water or gasoline, and there are several fitted as repair trucks, with different machine tools, welding outfit and stocks of material for such work as might be necessary in restoring damaged vehicles. One truck experimented at El Paso carried a three-inch field gun and its equipment, ammunition and crew, and it was found to be extremely serviceable. At different times the escort wagons have



F-W-D Chassis Equipped with an Escort Body, a Type That Is Generally Used in the United States Army Service.

been used for mobilizing bodies of troops, making long drives, carrying men and their arms and equipage. Statement is made that because of the exceptional service obtained with these machines they have been selected by army officials for all kinds of duty.

A group of 16 trucks has been equipped with collapsible searchlights that may be elevated to a height of 40 feet for the use of the engineering corps, and the signal corp has sought to have another group for the aviation division. There is reason to believe that this order will be shortly given. The company has reached the limit of its production with the present plant at Clintonville, Wis., and to meet the demand for F-W-D machines the factory will again be enlarged.

### EMPLOYEES GET FULL PAY.

The employees of the Pierce-Arrow factory, both married and single, who are now doing duty at the Mexican border, are receiving the equivalent of their

regular wages and when they return from service their positions will be open for them. There are about eight employees of the Pierce-Arrow plant in the commands in Texas, and when they first went away the married men were paid enough money to make total received, including their Federal wages, equal to what they were receiving at the factory, while the single men only received a sum equal to half their wages. But at a recent meeting of the directors it was decided to place the single men on the same basis as the married men.

### BOULDEN'S FURNITURE MOVED BY TRUCK.

H. T. Boulden, who recently became sales director of the Selden Truck Sales Company of Rochester, N. Y., moved his household effects from Syracuse to Rochester and having not only the courage, but also the knowledge of his convictions, used Selden trucks to do the work.

The trucks were loaded and started from Syracuse at 10 o'clock in the morning. After a 93-mile journey they arrived at Mr. Boulden's new home in Rochester at 8:30 o'clock on the evening of the same day. In figuring out the costs of transportation by the trucks and what it would have cost to pack and ship the goods by rail, Mr. Boulden found that he was not only much in pocket, but also received his furnishings in good condition and in about one-third the time that would have been required had he sent them by freight.

### ROUGH TRUCKING IN MEXICO.

Walter Gresenz, a driver of F-W-D Truck Corps No. 16, doing outpost duty in Mexico, tells a highly interesting story of conditions met across the border by truck drivers of the expedition that went after Villa.

Gresenz says: "People back East don't know the meaning of rough roads. At times there are chuck holes five or six feet deep to be negotiated for miles at a stretch, as well as sand up to the tops of the wheels, but the old F-W-D goes right through. We crossed mountain trails 7000 feet above sea level and ploughed through alkali dust that was so thick that we had to blow the horn constantly to prevent running into the man ahead or being hit by the one behind. Men's faces became so coated with dust that it was hard to tell who they were. Our trip extended a distance of 250 miles in Mexico and on the desert the distance between water holes was often 75 miles."

### WALTHAM BUYS KELLY-SPRINGFIELD.

The city of Waltham, Mass., has purchased a four-ton Kelly-Springfield truck, which will be placed in service in the street department hauling stone from the Bear hill crusher to lower Main street, where extensive road work is under way. An order has also been placed for a Republic truck to be used in the wire department.



## SHELDON SEMI-FLOATING WORM-DRIVE AXLES.

**Specially Designed for Truck Service, to Obtain Simplicity, Endurance and Extreme Efficiency, and Constructed of Materials of the Highest Quality.**

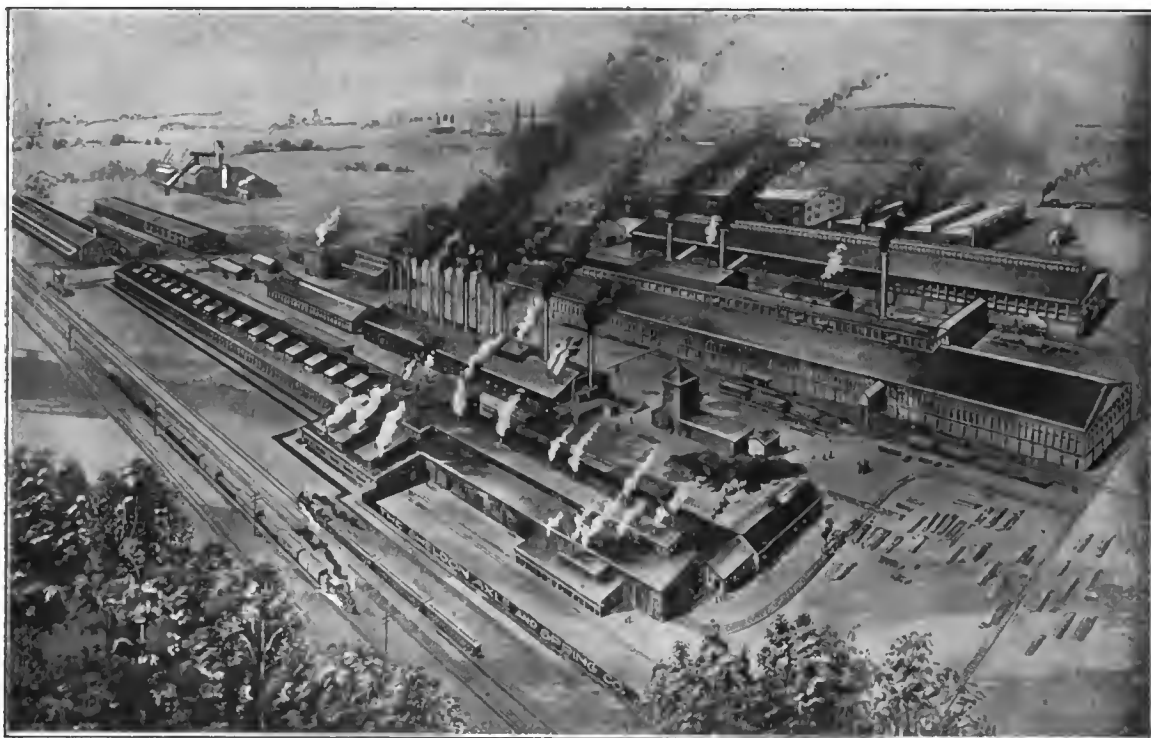
**S**PECIALIZATION has contributed more to the almost marvelous progression of the American power vehicle industry, which undoubtedly leads the world, than any other factor. While automobile development in Europe has kept pace with America, the difference in production may be judged from the fact that two of the largest factories in this country, not considering Ford machines, produce more vehicles than all European factories combined. The influence of the specialist upon the industry as applied specifically to trucks may be judged from the fact that 90 per cent. of the manufacturers build machines from units produced by specializing concerns, and practically all use axles, springs, rims, ignition systems, lamps, tires, fittings and similar equipment made by others.

Specialization in manufacturing motor vehicle units resulted from recognition by vehicle manufacturers that they could obtain what was equal to, if not better, than what they could build at materially reduced cost and without investment. Not only this, the very general adoption of what may be termed conventional design impelled the use of what may be regarded as standard units. The specializing concerns, realizing possibilities, organized engineering staffs, established laboratories, installed high grade machine and tool equipment, adopted systems and methods to obtain greater efficiency and economies, systematized production and engaged in extremely careful experimental work. With these facilities and competition stimulated by constantly increasing use of power vehicles, products were greatly improved, prices were decreased, and the names of many of the units became household words.

Some of the concerns have attained very large pro-

portions simply from the merit and quality of the units they build. While some vehicle manufacturers do not specify the makes of the components in the machines they produce, there are others who regard the trade names of the units as being substantial commercial assets, and list these in all specifications issued, absolutely relying upon the dependence of the public in the standards of quality established by specialists. In the motor vehicle industry, as in all others, quality is sought, and the demand for it is imperative in truck manufacturing, where economy and efficiency are absolutely necessary.

Constructional units are built to conform to the

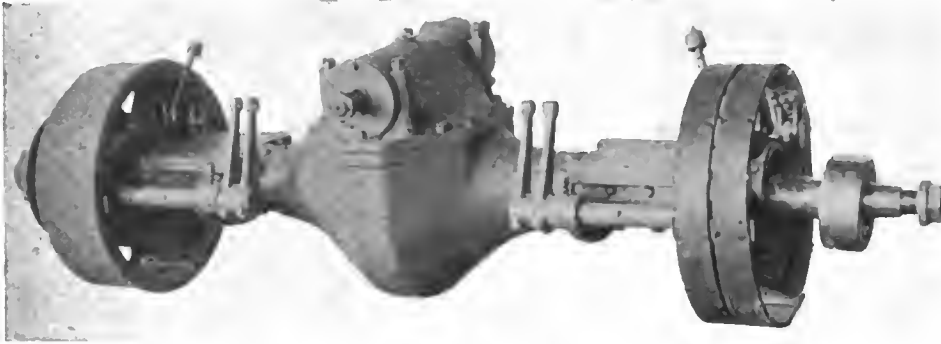


**The Plant of the Sheldon Axle and Spring Company at Wilkes-Barre, Penn., Which Employs 2000 Men and Has a Pay Roll of \$100,000 a Month, the Largest Industry in the City.**

standards of dimensions, and the material may be to the approved formulae of the Society of Automobile Engineers, but progressive specialization means more than interchangeability of parts and the uniformity of materials. It means the systematic study of the industry and its products and the development of what science and experience will dictate as best for a known or given condition.

Strangely enough, when the relations of the different units are regarded, no manufacturer has ever built engine, clutch, transmission gearset, rear axle and wheel brake complete, but instead, different concerns have specialized on each unit, so that in what may be regarded as a standard truck from the view-





Sheldon Type W-30 Worm Shaft and Wheel Driven Rear Axle, One Bearing Being Withdrawn from the Housing and the Brake Drum Off.

point of accepted motor vehicle practise, one will often find engine, clutch, shafting, universal joints, gearset, rear axle and one and even two wheel brakes all built by companies distinct and apart from each other. These are combined by the constructing engineer, who is usually known as the designer, so that they are harmonized so far as operating efficiency is concerned, each having been built to standard dimensions, so that no special fittings, tools or work are necessary in assembling them.

#### Transmission System Most Important.

Of all the units used in the construction of power vehicles, those making up the transmission system are most important, because the greater part of the operating cost depends upon the efficiency of applying the power. Of these systems, and they are numerous, the first unit in point of importance is the rear axle. There are many factors weighed by truck builders in their choice of constructional units, but all are agreed that what will be constantly efficient, will endure for a long period, and will be economical from the viewpoint of maintenance and operating cost, is to be preferred to what will not have these qualities and be sold for smaller prices. The power is applied to the road wheels of practically all machines through the rear axle. The expense of operating depends in a much greater degree than is generally realized upon the design and construction of the driving axle. Much attention has been given by engineers to designing and constructing axles, to obtain the necessary lubricity, to protect the moving parts against abrasive action, to minimize wear and to reduce the frictional loss of power to the smallest degree possible.

Seemingly there is every reason why rear axle types should be developed with extreme care, but the exacting requirements of motor truck practise, the necessity of high efficiency, and the probable assumption that there was a greater market for pleasure car units, has limited the number of specialists engaged in the manufacture of these parts. One of the

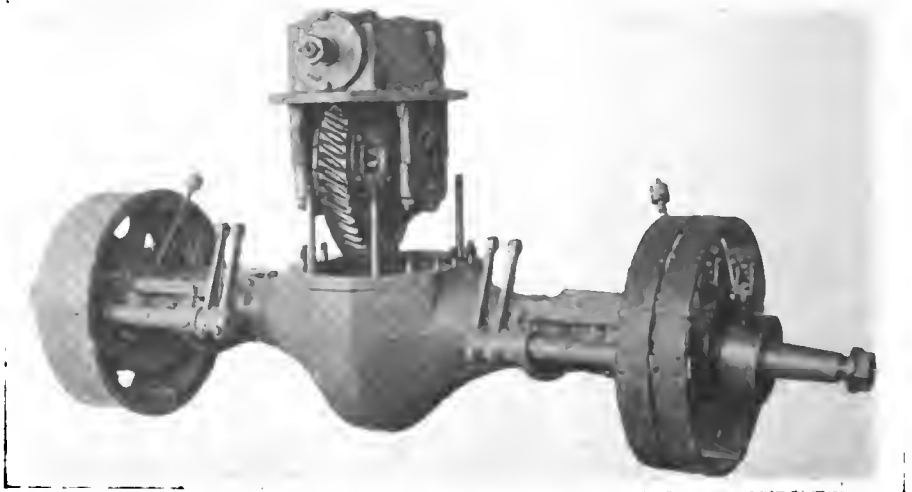
best known concerns engaged in the axle industry is the Sheldon Axle and Spring Company, which operates a very large plant at Wilkesbarre, Penn., and which is known as one of the largest, if not the largest, concerns of the kind in America. While this company originally operated at Auburn, N. Y., where it was engaged in producing axles for horse drawn vehicles, it was pur-

chased by Wilkesbarre capitalists and removed to that city in 1886, a charter being granted to the incorporators March 15 of that year. The first president was Charles L. Sheldon, whose name was given the company. A plant was established between North Pennsylvania avenue and Scott street, and power, forge and machine shops were equipped to produce axles of all types for carriages and wagons.

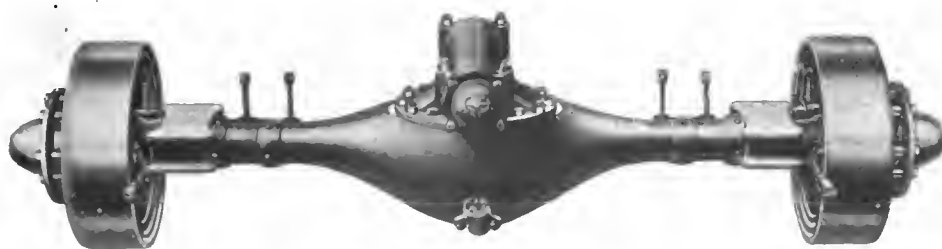
#### Begun Spring Production in 1900.

These products were continued until 1900 and then a large addition to the plant was built and equipped for the manufacture of vehicle springs of all sizes and types. While engineering in axle building was given the attention that was impelled by the manufacture of highest grade products, the production of springs necessitated extreme care in the selection of material, the design and construction, as well as tempering the metal, and the plant was equipped with the purpose of obtaining exceptional quality. In 1909 the spring division was enlarged by the erection of a building 458 feet length and 65 feet width, in which was installed the best facilities obtainable for spring making.

In the same year the company entered into the power vehicle industry by equipping a part of its plant with machine tools for building axles. There was at that time a large demand for springs suitable for automobile construction, and with a keen realization of the opportunities in producing axles, which was a logical progression from manufacturing carriage and wagon



Sheldon Type W-30 Worm Shaft and Wheel Driven Rear Axle, with the Worm Shaft, Worm Wheel and Differential Gearset Assembly Lifted from the Housing.



Sheldon Type W-1000 Worm Shaft and Wheel Driven Rear Axle Complete, Showing the Top of the Housing and the Spring Seats.

parts, the company established an automobile axle engineering department and engaged in experimental work until it had developed types that were at least equal, if not superior, to any produced by other concerns. The purpose was to specialize and obtain what would be recognized for its quality, and which would justify this recognition by the results in service. That the company was of large proportions before engaging in automobile axle building may be judged from the fact that its production of horse drawn vehicle axles was 1600 sets a day, or about 480,000 sets a year, these ranging in sizes to meet all carriage or wagon or truck requirements. The spring department had been developed to supply the demand created by automobile construction, which had been extremely rapid.

#### Value of Knowledge of Metals.

The experience with metals, and the scientific treatment of them to obtain precise qualities and results in spring making, was decidedly valuable when axle building was begun. The first products were both front and rear axles for pleasure cars, these constructions including drop forgings and cast and pressed steel housings. Instead of producing to specification only the policy of the company was established with a view of meeting the demands of the industry generally, building such types as might be regarded as standard in conventional practise. Later on the company began to build truck axles and this production was considerably increased.

The industrial possibilities of truck axle building were believed to be such as would justify the company engaging in it on an extensive scale, and a very careful investigation of all types of rear axles was begun, which included much experimental and development work; and when the engineering determinations had been made decision was reached to construct a worm and worm wheel rear axle and a semi-floating type. The statement is made by the company that the semi-floating type rear axle was decided after exhaustive observation and experiment and every endeavor had been made to establish the relative values of this type as compared with other constructions.

In the engineering research and test there was no reason to favor the one type as against another, but there was every reason, from the viewpoint of the practical manufacturer, to determine which would afford the better service—the full-floating type, which carries the load on the axle housing, or the semi-floating type that

carries the load on the axle shaft itself. By this is meant that the company sought what would afford the best axle that it could produce without reference to any other factor. The purpose, after the type had been decided, was to develop it with extreme care. The long manufacturing experience and knowledge of the service requirements was extremely beneficial in that these dictated design and construction that would not only have high efficiency, but great endurance.

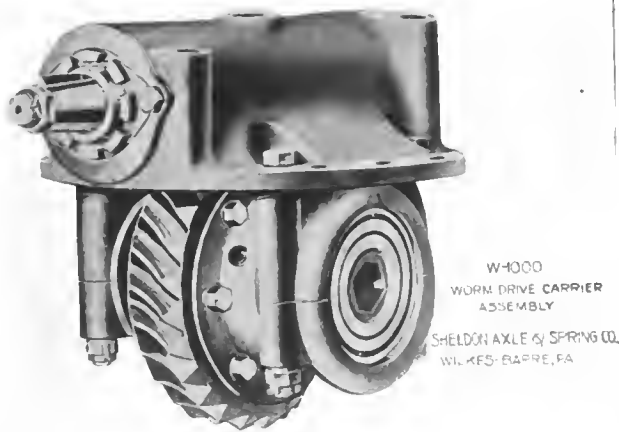
There were several important factors that were considered from every aspect, and among these were simplicity, weight, carrying capacity, cost and maintenance, the object being to obtain each of these to the fullest degree that was consistent with the design and without sacrifice of any desirable quality. Of these, simplification meant a reduction of the number of parts assembled in the unit and economy of labor in the event of any necessary work upon it. Minimum weight was essential because power must be created to drive the vehicle, and this can only be obtained through the consumption of fuel and lubricant. Each additional pound of weight means that more fuel must be used, and this is a reason for expense that cannot be curtailed, especially when work must be done. Not only this, lessening the weight under the springs and upon the tires is maintained by tire manufacturers to be a large economy, some maintaining that a pound of unsprung weight is equal in point of tire wear to 10 pounds suspended on the vehicle springs. Though tire cost is not the only item of operating expense, when greater endurance can be gained without sacrifice of any other quality, the engineers believed that this was a positive and distinct gain that should not be rejected.

#### Load Carried on Axle Shafts.

The weight of the load is carried by the axle shafts



Sheldon Type W-1000 Worm Shaft and Wheel Driven Rear Axle Fully Assembled Without the Wheels.



**The Worm Shaft, Wheel and Differential Gearset Assembly of the Sheldon W-1000 Rear Axle.**

with the semi-floating type of rear axle, so that the carrying capacity is dependent upon the proportions and dimensions of the shafts, which can be practically constructed of any metal and of any size that is necessary to afford sufficient strength, and the axle housing may be a single casting or sectioned as required, fitted with bearings that are so located that the load stresses are well distributed. With any form of axle having a differential gearset the inner ends of the driving shafts engage with the gears of the differential, and the gears are carried upon bearings, but with the semi-floating type the outer ends of the shafts are mounted in bearings carried within the ends of the housing, so that the support of the load is upon these bearings practically the full length of the shafts (aside from the ends on which the wheels are fixed) and in decided contrast with other constructions where the load is supported by bearings that are contained entirely within the wheel hubs.

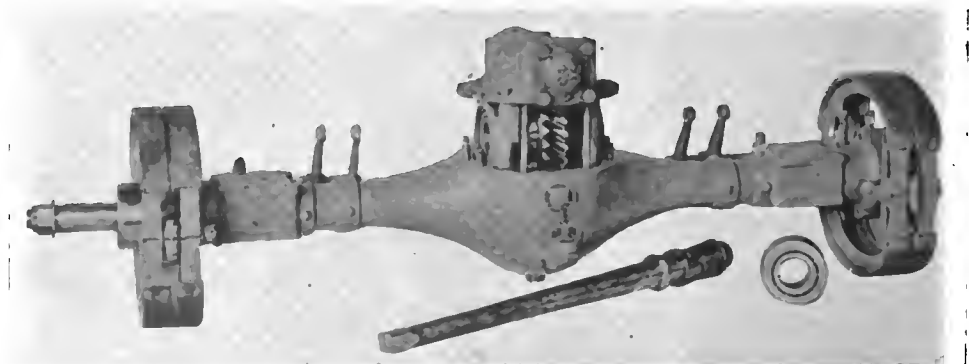
To illustrate, the shaft of the semi-floating axle is supported by bearings for half the length of the axle housing and because of the greater leverage between the bearings any direct stresses from load are distributed or carried by the shaft in the bearings, and borne only by that portion of the shaft outside of the bearings. The application of this statement can be better understood by reference to the drawings included in this article. Examination of the drawing of the axle shaft will show that it is tapered from a point just outside of the differential gear to the outer bearing, in which it has its greatest diameter, and from this bearing to the outer end, affording the strength where it is needed to resist every character of stress upon it. Claim is made by the Sheldon engineers that the location of the bearings is such that any shock or impact at the tire or rim of the wheel is very greatly reduced, or to put it another way, so

much better distributed that the load upon them is lessened by approximately 36 per cent. for the outer bearing and 60 per cent. for the inner or differential bearing as compared with any other form of axle in which the bearings are mounted on the axle housing. There can be no question that the carrying capacity of the axle is limited by the strength of the axle shaft and the size of the bearings, assuming a maximum load, and as bearings are decidedly expensive, the size necessary for a given load may be considerably smaller with the semi-floating type, this being a cogent factor in reducing cost of production. Each axle shaft is mounted on two bearings in the semi-floating type instead of three as in the full floating axle.

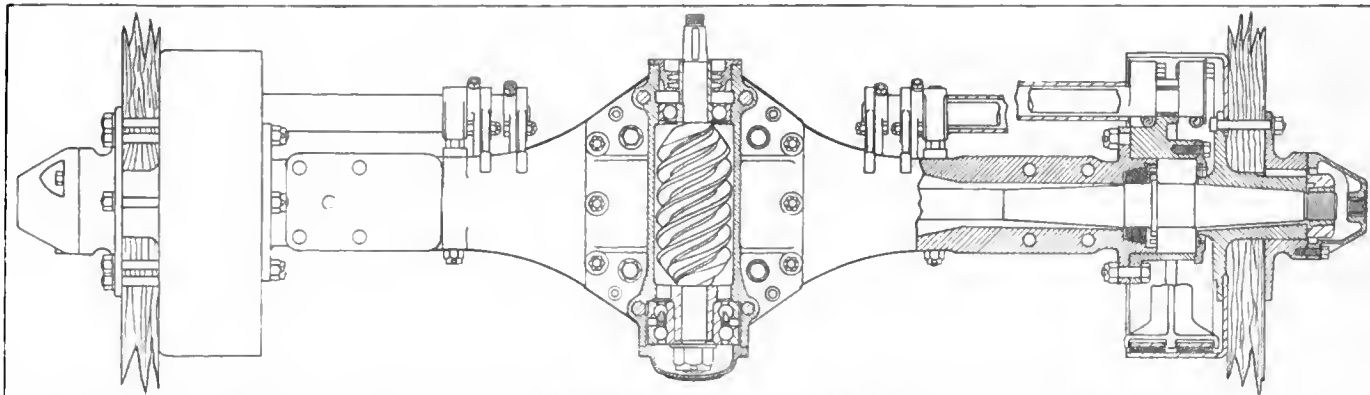
#### **Why Construction Cost Is Low.**

This brings up the subject of construction cost, and as the semi-floating type is lighter in point of metal, has approximately a third less parts, the housings may be simple castings that require minimum machining and tool operations, and the bearings may be smaller, these all contribute to lessened expense, while the greater simplicity means minimized wear and maintenance attention. The reference to lessened expense does not mean that the axle is cheapened, or that its price is as low as may be charged for other types, but it does mean that where a very high quality is obtained and the cost of obtaining this quality can be reduced by careful designing and production methods, the buyer is directly benefited.

In the consideration of the maintenance expense there are several factors that are decidedly important. The one of these is the labor that is necessary in cleaning, restoring and possibly repairing, and which will be considerable in the life of a truck. The axle shafts, as will be noted by reference to the drawings, are carried in hexagonal bores in the gears of the differential gearset, and that the smallest diameter of the shafts is at the inner ends of the hexagonal portions of the shafts. The weakest point of each shaft is at the smallest diameter, and this is designed to be so located that in the event of a torsional strain exceeding the strength of the metal the shaft will break where it will not damage the axle more nor will the wheel and shaft be withdrawn, for the bearing retainer will keep the shaft in the axle housing, and the axle cannot drop. Thus,



**Sheldon Type W-1000 Worm Shaft and Wheel Driven Rear Axle Without the Brake Drums and One Wheel Bearing and Axle Shaft Removed.**



Drawing Showing the Top View of Sections of the Worm Shaft and Bearings, the Axle, Axle Bearing and Brake Construction of the Sheldon W-102 Axle.

should a shaft be broken, this can be easily replaced and the cost will be comparatively small.

#### How Axle Shafts Are Retained.

The axle shaft ends fit in the hexagonal bores of the differential gears, they being retained in the axle housing by the bearing retainers at the outer ends of the axle housing, and when the bearing retainers are released the shafts can be withdrawn, but the wheels must be removed before the retainers can be reached. So, to remove the differential gearset from the axle the wheels must be taken off, the retainers unbolted and the shafts withdrawn. This may appear to be considerable labor when contrasted with types so built that by removing the hub caps the shafts can be taken out and the differential gearset released after the carrier or cover is unbolted. But there is another aspect that must be considered.

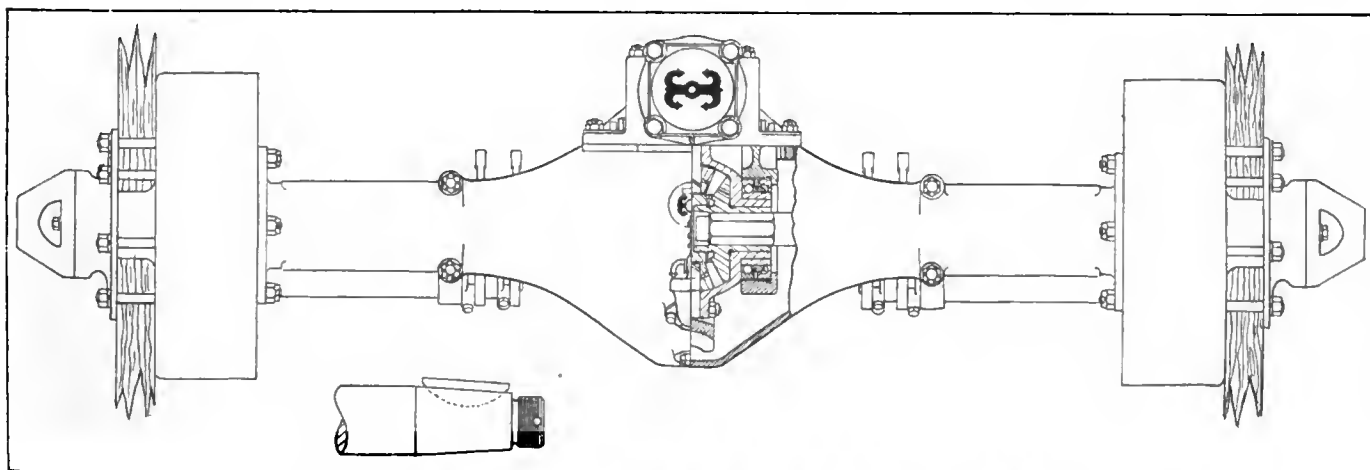
In the first place, all worm shaft and worm gear assemblies are carefully adjusted before they are sent from the factories, and as the adjustment of both the shaft and gear must be exact and can only be made by thoroughly experienced men, any change might cause much damage and greatly reduce the efficiency of the axle. The Sheldon differential gearsets and worm shafts and gears are mounted on ball bearings, which are not adjustable, and as these are seated with extreme care and shims may be used to obtain exactness, no change can be made. The differential assembly may be withdrawn from the housing for cleaning or

examination, but it must be replaced exactly as it was originally. With good lubrication there can be no appreciable wear, even with long service. So there is very seldom necessity of taking out the shaft, gear and differential gearset, and any seeming advantage that might obtain with a different construction becomes decidedly immaterial when the axle is examined.

#### Simplicity of Wheel Removal.

The semi-floating axle must be jacked to remove the wheel, but this is true of any other type, and the operation is extremely simple. The wheel is retained on the shaft by a key and two lock nuts or a nut and a pin. The hub cap is retained by cap screws that are removed and the cap can be taken off. The pin securing the nut on the shaft end is taken out or the two nuts, the one enclosing the other, are unscrewed. The hub cap is drilled and tapped directly over the centre of the axle shaft end, which opening is closed by a spring retained cover. When the cover is withdrawn a special bolt is screwed into the opening in the hub cap, and when a wrench is applied to the head of the bolt and it is set against the shaft end, the cap and bolt become a very efficient wheel puller that will force the wheel from the shaft, if the wheel rim be tapped with a hammer.

This is especially desirable accessibility in the event that tires must be changed. A wheel can be quickly taken off and without any change of adjustment, and it can be as easily replaced. The axle shafts



Vertical Section of the Differential Gearset and Worm and Wheel Carrier of the Sheldon W-102 Axle.

are usually mounted on ball bearings, but in the event that roller bearings are specified for the outer ends these are supplied. With ball bearings there can be no adjustment and because of the character of lubrication there is rarely appreciable wear.

#### **Worm Shaft Has Ball Bearings.**

The mounting of the worm shaft in Sheldon axles is always on annular ball bearings, which is one of the fundamental principles of construction. This has always been adhered to and the claim is made that this means minimum frictional resistance, which has been substantiated by sound engineering, and where there is a thrust load there can be no substitute that will afford the same results.

(To Be Continued.)

### **NEW YORK ELECTRICAL EXPOSITION.**

The New York electrical exposition of 1916, which will be held at the Grand Central Palace, Oct. 11 to 21, will include a representative showing of both pleasure and freight carrying electrical vehicles and various accessories. The Baker R & L and Detroit cars will be shown among the pleasure vehicles and commercial electrics will be exhibited by the General Vehicle Company, the Walker Vehicle Company and the Ward Motor Vehicle Company.

The Electric Storage Battery Company and the Edison Storage Battery Company are to have comprehensive exhibits and the Electric Garage of Central Park West, one of the largest electrical garages in the world, will have an exhibit showing the facilities it has for handling and maintaining electrical vehicles in operation. An important feature in connection with the exposition will be a test run.

### **NEW BIDS FOR FIRE APPARATUS.**

At a recent meeting of the council committee on fire department of the city of New Bedford, Mass., it was voted to return all the bids received for furnishing the city with fire apparatus and advertise for new bids. This action was taken as a number of representatives of motor driven fire apparatus who had entered bids objected to certain stipulations in the specifications. One of these clauses called for an electric driven truck, and representatives of the gasoline driven apparatus builders present claimed they could not bid under the contract specifications.

### **F-W-D TRUCKS IN CANAL ZONE.**

The United States quartermaster general's department has purchased a F-W-D truck equipped with a power winch at the rear for use in the Panama canal zone at Christobel. This same type of truck has been used by the Russian and other European governments in military service and proved highly satisfactory under the most exacting conditions.

### **HERSCHELL-SPILLMAN MOTORS.**

The Herschell-Spillman Company, North Tona-wanda, N. Y., which maintains one of the largest gasoline engine manufacturing plants in the United States, is building a large addition to its plant to provide increased facilities to meet the large demand for its products.

Guy R. White, vice president and general manager of the company, in speaking of the enlargement of the plant said: "Up to the present time we have found it almost impossible to take care of the demand for our motors, especially the eight-cylinder V type. This one type of motor has proven so popular that we have had to treble our production on it alone. Workmen have been on the job night and day rushing to completion the new factory, which will be turning out motors in a short time. The addition is concrete construction and is to be equipped with safety and labor saving devices of recent development. We hope it will enable us to keep pace with the demand."

### **DANBURY FAIR AUTOMOBILE SHOW.**

The Danbury Fair Automobile Show, which has developed considerable importance in trade circles, will be held this year at the Danbury fair from Oct. 2 to 7 inclusive.

The trucks will be shown in a large tent, as the demand for space has been so great the management was obliged to provide additional room. Other tents will be erected for the accessory exhibits. This exhibition has become very popular, as a large number of the latest models have always been shown, and these exhibits in turn have attracted crowds of automobile enthusiasts, with the result that many sales have been consummated. G. M. Rundle, Danbury, Conn., is directing the automobile exhibition.

### **KISSEL TRUCKS FOR ROAD WORK.**

Six years ago a prominent contracting firm purchased a Kissel truck for use in road construction work and at the time was doubtful as to its economy, but after working it out together with the horse drawn carts for about a year another was purchased. During three succeeding years three other Kissel trucks were added to the fleet to take care of the rapidly increasing business, the machines having proven their economy in operation as well as in efficiency in the work.

### **PACKARD PRODUCTION VERY LARGE.**

The Packard Motor Car Company, Detroit, Mich., for the year ending July 31 manufactured approximately 12,750 vehicles, consisting of 7,750 pleasure cars and 5,000 trucks. It is estimated that the net earnings of the company will exceed \$6,000,000, as compared with \$3,000,000, the earnings the previous year.



**N. A. C. C. COMMITTEES FOR 1917.**

President Charles Clifton of the National Automobile Chamber of Commerce has appointed these committees to serve during the ensuing year in carrying out the various activities of the organization:

Patents: C. C. Hanch (Studebaker), chairman; William H. Van Dervoort (Moline), Winsor T. White (White), Wilfred C. Leland (Cadillac), Howard E. Coffin (Hudson).

Traffic: William E. Metzger (Argo Electric), chairman; R. E. Olds (Reo), A. I. Philp (Dodge).

Show: George Pope, chairman; Wilfred C. Leland (Cadillac).

Legislative: H. H. Rice (Waverley), chairman; J. Walter Drake (Hup), J. I. Farley (Auburn).

Electric Vehicle: H. H. Rice (Waverley), chairman; Fred R. White (Baker-R & L), W. C. Anderson (Anderson).

Commercial vehicle: Winsor T. White (White), chairman; Alvan Macauley (Packard), H. Kerr Thomas (Pierce-Arrow), P. D. Wagoner (General Vehicle), M. L. Pulcher (Federal).

Good Roads: Roy D. Chapin (Hudson), chairman; William E. Metzger (Argo Electric), C. C. Hanch (Studebaker).

Hand Book: Carl H. Pelton (Maxwell), chairman; A. I. Philp (Dodge), A. L. Riker (Locomobile).

Membership: Wilfred C. Leland (Cadillac), chairman; Hugh Chalmers (Chalmers), C. W. Churchill (Winton).

**PACKARD WORM DRIVE BULLETIN.**

The Packard Motor Car Company, Detroit, Mich., has issued a bulletin on Packard worm drive motor trucks, which gives a brief but interesting history of the development of the worm drive principle and its application and use on the Packard trucks.

The bulletin states that in 1913 only one per cent. of the motor trucks manufactured by recognized truck builders were worm drive types. All other forms of final drive made up 99 per cent. of the total. In 1915, 58.6 per cent. of all motor trucks manufactured were driven by worm shaft and wheel. All other types of final drive represented only 41.4 per cent. of the total.

**TRACTOR DEMAND IN CUBA.**

H. M. Wolcott, United States vice consul at Havana, Cuba, in his communications to the State Department writes that there is a growing demand in Cuba for both light and heavy tractors, and he believes that many will be sold there this year.

The large sugar estates, according to Mr. Wolcott, afford the best opportunities as prospects for tractor salesmen, although tractors are in use to a considerable extent on the smaller plantations.

**FAST WORK WITH BIG TRUCKS.****Handle 77 Tons a Day in Constructing New Jersey Highways.**

E. C. Humphrey, contractor, of Hackensack, N. J., who has a reputation for being one of the fastest operators on road contracts in the country, has made a record with his fleet of six five-ton Pierce-Arrow trucks that is probably unparalleled.

Every unit in the Humphrey organization is worked at high pressure, but in keeping with conditions that will obtain first quality results. To do this both men and machinery are pushed to their utmost capacity and often the machinery is taxed beyond its rating to secure quick results. This has been particularly true with the fleet of Pierce-Arrow trucks. Overloading is a common practise and the breakage of parts is practically overlooked, immediate replacements being made to keep the trucks on the job no matter how hard the service.

When the work of building New Jersey roads near Hackensack was started by Mr. Humphrey last April he had in use three five-ton Pierce-Arrow trucks and ordered three more, all of which were delivered and were in service by August 15. To facilitate the operation of the truck fleet the asphalt making plant was brought to the Hackensack dock of the Humphrey company and everything was arranged on the dock to facilitate quick work. Loading was done through a hopper, taking only one and one-half minutes, but in loading asphalt 12 minutes was lost in the yard. Two hundred days were taken to complete the job and during that time the following amount of material passed through the yards: 100 scows of sand and stone, averaging 900 tons each; four loads of lime dust, averaging 400 tons each; nine boat loads of asphalt, averaging 400 tons each; six boat loads of paving block, averaging 900 tons each; three boat loads of coal, averaging 350 tons each; two boat loads of paving blocks, averaging 450 tons each.

Often in a 24-hour day the trucks made 200 miles and one truck during a 10-hour period covered 135 miles. Two other smaller trucks of another make were used part of the time in the work, but their capacity is small and altogether the total volume of material moved was 102,550 tons. Figuring that six trucks did the work in 200 days and making deductions for the other two trucks, the books of the company show that the average to the credit of each truck was about 77 tons a day.

**KILBY LEAVES WOODS MOBILETTE.**

K. E. Kilby, who was advertising manager of the Woods Mobilette Company and the Sheridan Commercial Car Company, has resigned that position and will shortly take up similar work with another company.

## CENTRAL SCHOOL TRANSPORT.

### International Trucks and Special Bodies Used For DeGraff, Ohio, Service.

A short distance from Akron, O., is the town of De Graff, the population of which is widely scattered, and that the children of the town might have the best education possible, or at least what would compare favorably with the educational advantages of the city, the school department adopted the centralization plan, building and equipping a school that has all the facilities of the best institutions of the kind.

A considerable number of the scholars live so far from the school that they could not walk to and from it with comfort, and that they might have equal opportunity a system of transportation by horse vehicle was planned, there being regular routes that are traversed twice daily, before and after school hours, calling for



International Trucks Fitted with Special Bodies for Use as Transports to the Central Schools of De Graff, O.

and leaving the pupils at their homes or points convenient to them. Because of the increased attendance and the greater length of the routes, as well as with the desire to reduce the cost and at the same time improve the service, the school department purchased three International truck chassis that are equipped with special bodies, these being designed by and built in the shops of the company to meet requirements of town, large seating capacity being especially desirable.

These are enclosed, so as to fully protect the passengers, and are well ventilated. Seats extend the length of the bodies at either side, and between these are lower and narrower seats for smaller children. The bodies are warmed by air heated from the exhaust pipes. The bodies are substantial and extremely attractive. The arrival of the 'buses in the town was the occasion for a parade to demonstrate the machines and inform the people of the character of the equipment at their service.

## WOULD LIMIT WEIGHT OF TRUCKS.

Superintendent of Streets Manning of Fall River, at a hearing of the special commission of Massachusetts appointed to revise and recodify the highway laws of the state, offered the suggestion that the law be changed regulating the weight of trucks to 1000 pounds to the tire inch. In this connection he mentioned the case of a truck in Fall River which has 5½-inch iron tires. He said he weighed it with a load of lumber recently and the weight was 26,000 pounds.

## BEARINGS SERVICE COMPANY.

The Bearings Service Company, with general offices in Detroit, has been organized to afford a service for anti-friction bearings for all types of motor vehicles. The Timken Roller Bearing Company, the Hyatt Roller Bearing Company and the New Departure Manufacturing Company have contracted with the new concern to handle the service demands upon them.

Service branches of the Hyatt and Timken companies will be taken over and conducted by the new concern in nine different cities. These branches will have ground floor locations and will carry complete stocks of ball, taper roller and flexible roller bearings for automobiles, motor trucks, farm tractors and motorcycles. The service will be extended into other cities until union stations have been established in 50 or more centres. The service in this way will be brought within easy reach of every automobile owner.

General offices of the company have already been opened at Woodward and Warren avenues in Detroit. The present branches are located at Atlanta, Ga.; Boston, Mass.; Chicago, Ill.; Detroit, Mich.; Los Angeles, Cal.; Minneapolis, Minn.; New York, N. Y.; San Francisco, Cal., and Seattle, Wash.

## REPUBLIC COMPANY HAS NEW CHARTER.

The Republic Motor Truck Company, Inc., has been chartered in New York state to take over the business of the Republic Motor Truck Company of Alma, Mich. The new company has an authorized capital consisting of \$1,000,000 seven per cent. cumulative preferred and 62,500 shares of common stock of no par value. A block of \$750,000 of the preferred stock has been purchased by George H. Burr & Co., of New York, and this money has been paid into the treasury.

**MOODY IS EASTERN SALES MANAGER.**

C. W. Moody, eastern sales manager of the Gramm-Bernstein Company, has established offices in New York City, where he has been located for up-



C. W. Moody, Eastern Sales Manager of the Gramm-Bernstein Company.

wards of six months, and the activities of his organization are in the principal cities of New York, Pennsylvania, New Jersey, New England and the Atlantic Coast territory, all of which is receiving his personal attention. Mr. Moody has been engaged in selling and manufacturing trucks for 10 years, but his experience the past two years has been specially interesting and it is

directed to benefit the truck dealers, for Mr. Moody maintains that his ambition is to see that every man representing him makes money.

Shortly after the declaration of war in Europe, Mr. Moody took a series of Gramm-Bernstein trucks abroad and located in England, where he organized a sales force and established an assembly plant, having the same facilities and service in that country as he would have had in America. The result was the development of a business that has averaged for 18 months approximately 100 trucks a month for export.

During his stay in England he studied European trucks and worked in harmony with the company at Lima to improve the machines built in every practical way, so that they are regarded as affording nearly 100 per cent. service and satisfaction. Statement is made that the sale of Gramm-Bernstein trucks in Mr. Moody's territory has increased more than 500 per cent. There is reason to believe that the plans for sales and service development for the coming year will mean still further increase. Mr. Moody's policy is not to attempt to do business in any territory until the dealer has been educated to meet every condition that may arise, so that he is informed of operating cost and transportation engineering, that the buyer may be insured that the truck he purchases will exactly meet his requirements. This policy means business success and satisfied dealers and customers.

**THE TORBENSEN AXLE COMPANY.**

The Torbensen Axle Company, which was formerly called the Torbensen Gear and Axle Company, will shortly occupy its new plant in East 152nd street,

Cleveland, O., which is rapidly nearing completion. The manufacturing shops, as well as the offices of the company, will be located at this site.

The new works is located on a property of four acres, will be a model of up-to-date construction and will be equipped with the very latest types of modern machinery, which will enable the company to considerably increase its production.

Four buildings are now nearing completion, a machine shop with 12,000 square feet of floor space; a machine shop with 10,000 square feet of floor space; a warehouse with 4000 square feet of floor space and a warehouse with 10,000 square feet of floor space. In the near future another machine shop with 15,000 square feet of floor space will be added.

**SMITH IS BUDA SALES MANAGER.**

Lon R. Smith, for six years western representative of the Eisemann Magneto Company, located at Indianapolis, Ind., has become manager of the sales of the Buda Company of Chicago and Harvey, Ill. The Buda company is exceedingly well known as a manufacturer of engines adapted for automobile vehicles, including pleasure cars, trucks and tractors, and because of very large demands its manufacturing facilities have been frequently increased for several years, so that its production is today triple what it was three years ago.

The policy of the company has always been to make engines of exceptional quality regardless of the immediate or temporary needs of the industry, at some stages, for successively rapid manufacture and low price. There is very general recognition that the best engines that can be built are absolutely essential to the successful service of the vehicles they are installed in.

Mr. Smith was especially successful while with the Eisemann company because he knew electrical systems, not only of the magneto manufacturers, but of automobiles generally, and was able to deal with all manner of problems intelligently and so as to obtain results. While in Indianapolis Mr. Smith was chairman of the Indiana section of the Society of Automobile Engineers, vice



Lon R. Smith, Manager of Sales of the Buda Company.

president and director of the Hoosier Motor Club and was actively identified with the Indianapolis Automobile Trade Association and the Indianapolis Gun Club.

**FEDERAL "TRAFFIC NEWS."**

In the latest issue of the Federal "Traffic News," published by the Federal Truck Company, Detroit, Mich., there is an illustrated article on the "First Truck Over the East Michigan Pike," which describes the journey made with a Federal 1½-ton truck, which carried all the baggage of a delegation from the Detroit Chamber of Commerce from Detroit to Mackinaw City. The road conditions were exceptionally bad at times.

**LARGE STUDEBAKER OUTPUT.**

Claim is made by the Studebaker corporation that the production of freight vehicles from its plants exceeded that of any other concern in the country during the first six months of 1916.

This is maintained to be a very remarkable record, as up to eight months ago the Studebaker line of trucks was limited to half-ton capacities. The addition of a one-ton machine with several types of bodies, equipped with engine starters, electric lights, speedometers and other accessories which are not included as standard equipment on many other makes, enormously increased the company's business.

**MASTER CALORITE PLUGS.**

The Hartford Machine Screw Company, Hartford, Conn., manufacturer of the Master Calorite spark plugs, has been awarded the contract for supplying the spark plugs required by the postal service for the ensuing year.

The use of these plugs has been steadily increasing, for they are known to motor vehicle users as affording exceptional results where constant and hard service is required.

**TIMKEN MAGAZINE.**

The September number of the Timken Magazine, published by the Timken-Detroit Axle Company, Detroit, Mich., under the title of "How I Can Tell," carries an article on anti-friction bearings in motor cars which is novel in its treatment of the subject and is intensely interesting. It is a plain and untechnical description of what an anti-friction bearing is, why it is and the reasons why some types are more advantageous than others. It is graphically illustrated to make clear the points brought out.

**TAKES ON HOOD SERVICE.**

The Bond Motor Company, Kansas City, Mo., distributors of Saxon cars and one of the oldest concerns in Kansas, has signed a contract with the Wallace C. Hood Service Bureau of Detroit, Mich., for the latter company will represent its interests.

**BUY CARS TO SELL TRUCKS.**

The R. E. Taylor Corporation, agent for Garford motor trucks in New York

and Boston, recently purchased 20 Maxwell touring cars for the use of its sales force. The machines have been painted a pure flat white with the Taylor insignia, a big red "T" on the door panels. They are very conspicuous and in addition to providing a means of speeding the salesmen out on their appointments are of considerable advertising value.

**PORTABLE EXHIBIT HALL.**

The 13th number of the "GMC Truck Talk," published by the General Motors Truck Company, Pontiac, Mich., contains an interesting story of a portable exhibit hall which is used by the Northwest Buick Company, distributor of Buick pleasure cars and GMC trucks in the Pacific northwest.

The Northwest Buick Company purchased a tent 40 by 80 feet last June and since that time has used it in different places to hold exhibitions of the latest models in both trucks and pleasure cars. At the conclusion of an exhibition the tent is taken down and packed on the GMC trucks and either carried back to headquarters or to another place for show.

**INSTALL COOLING SYSTEM.**

The Goodyear Tire and Rubber Company is erecting a cooling system at its Akron, O., plant to conserve the water supply which feeds the boilers for the great 10,000 K. V. A. turbine. When completed 12,500 gallons of water may be cooled each minute and used over again indefinitely, and it is estimated that in a year the water wastage will amount to less than five per cent.

**NEW SERVICE APPOINTMENTS.**

General Sales Manager Rosebery of the Service Motor Truck Company, Wabash, Ind., made several new appointments to the sales force of the company during the past month.

Albert Hauptli, Jr., formerly of the New York branch, has been appointed district sales manager for the territory of Wisconsin, Minnesota, Iowa and Nebraska.

G. J. Barrow has been appointed district sales manager in the southern territory to cover Tennessee, North and South Carolina, Georgia, Florida, Alabama and Mississippi.

**METROPOLITAN MOTORS, INC.**

The Metropolitan Motors, Inc., of which W. C. Mack is president, is pushing the work of installing new machinery in its factory at 585-587 Jackson avenue, Bronx, New York City, where a half-ton truck will be built.

It is expected that the factory will soon be equipped and will turn out 10 chassis for display at the agencies in New York, Boston, Chicago and other cities. President Mack has just returned from a second trip to the centres where the big

parts manufacturers are located and announces that Metropolitan trucks will shortly be produced.

**BOSCH FACTORY EXPANSION.**

The Bosch Magneto Company has broken ground for a second addition to its works at Springfield, Mass., which will provide 60,000 additional square feet of floor space. With its completion this will make a total of 130,000 square feet of manufacturing space that has been added to the Bosch plant this year.

**DE MARTINI PLANT EXPANSION.**

The De Martini Auto Truck Company, San Francisco, Cal., is having an addition erected to its property at the southerly line of Pacific street, between Montgomery and Sansome streets. The new building is of concrete and steel, three stories in height and covers an area of 68.9 feet wide and 137.5 feet long.

**NEW M. A. M. MEMBERS.**

Three accessory and manufacturing concerns were recently added to the membership roll of the Motor and Accessory Manufacturers. The new members are the Au-To Compressor Company, manufacturer of air compressors, bumpers, tire holders, connecting rods, etc., of 233 Mulberry street, Wilmington, O.; F. W. Mann Company, manufacturer of automobile jacks, Milford, Mass., and the West Side Foundry Company, manufacturer of Casco tire pumps, Troy, N. Y.

**JOIN THE SELDEN FORCE.**

Edward F. Drew and Paul B. Donaldson, who were associated with H. T. Boulden when he was general sales manager of the Chase Motor Truck Company of Syracuse, N. Y., have joined Mr. Boulden's organization with the Selden Truck Sales Company at Rochester, N. Y. Both men will be connected with the home office at Rochester as special representatives.

**"LIKE KELLY DOES."**

The monthly publication of the Kelly-Springfield Motor Truck Company of Springfield, O., "Like Kelly Does," contains a very interesting and instructive article on the use of trucks in the border expedition service and manoeuvres.

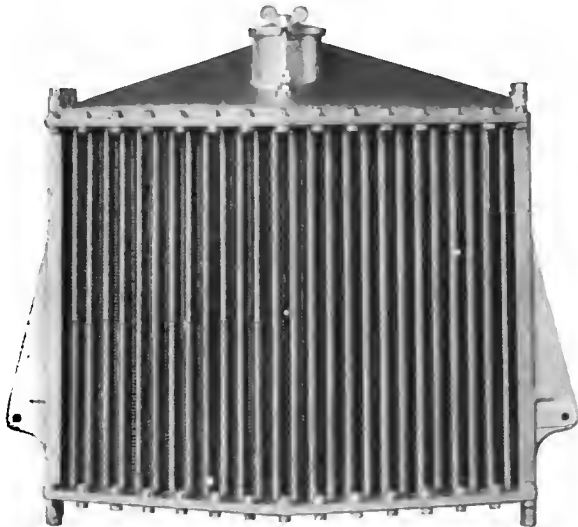
**NEW KOEHLER CORPORATION.**

The H. J. Koehler S. G. Company of Newark, N. J., and the L. E. Schlotterback Manufacturing Company have been merged into the H. J. Koehler Motors Corporation, which has a full paid capital of \$450,000. H. J. Koehler continues as the directing head of the company's affairs, which have expanded to a point where enlarged manufacturing facilities and a bigger organization became necessary.

## COOLING SYSTEMS GOVERN TRUCK SERVICE.

**Operating Efficiency Absolutely Depends on Cooler Design—Highest Quality Necessary to Endure—Simplicity and Economy of Radiator Types in General Use.**

**C**OOLING systems for power vehicle engines, which are generally means for circulating water through the jackets of the cylinders and quickly reducing its temperature, may appear simple, but as a matter of fact high efficiency is essential and is dif-



**Truck Radiator Built with Rome-Turney Helical Tube Cooling Section or Core.**

ficult to obtain because of the extreme variance of operating conditions. The work that a cooling system must do is understood by comparatively few. Practically all who have to do with power vehicles know that the cooling system is intended to safeguard the engine, yet aside from this knowledge, which is regarded as sufficient, but little attention is given to this very vital auxiliary to the power plant.

All internal combustion engines save a very small proportion are built with water jackets. The number of explosions vary with the type of engine, there being one in each cylinder each revolution if a two-cycle construction, and one every two revolutions if a four-cycle. If a four-cycle engine is driven at 1500 revolutions a minute, which is fast for a truck type, but comparatively slow for a pleasure car motor, this means 750 explosions a minute, or  $12\frac{1}{2}$  a second, which, if the engine is functioning normally, may create a temperature of 3000 degrees Fahrenheit or higher during the explosion stroke.

### Heat Would Destroy the Engine.

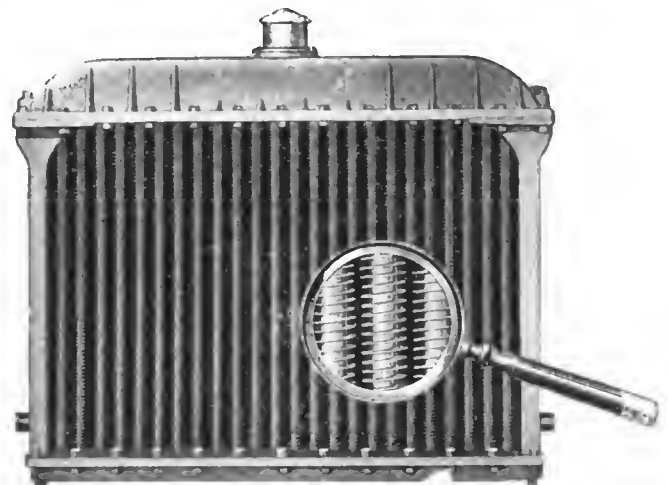
Obviously this heat would quickly destroy the engine if it were not diffused. Water will boil at 212 degrees Fahrenheit, and it very quickly absorbs heat. If cylinders are water jacketed and contain a sufficient volume of water so that it will not boil from the temperature the heat will be absorbed and the walls of the cylinders will be kept sufficiently cool so that the cylinders and the pistons will not be warped or cracked.

With efficient cooling the cylinder walls are kept at temperature probably not exceeding 700 degrees. Were the cylinders not so cooled large volumes of lubricant would be necessary and other means of radiating the heat resorted to.

A sufficient volume of water can be supplied to absorb all the heat radiated from the cylinders of an engine, but this would weigh heavily and no better result would obtain than by circulating the water through the cylinder jackets and a cooler, which may be done with pumps or by the movement of the water from heating. The cooler is not intended to condense steam, but to reduce the temperature to a point slightly less than boiling when the engine is driven to approximately its maximum capacity, and generally these coolers are known as radiators, because they expose large surface areas to the air and radiate the heat from the water. The radiation is promoted by creating a very rapid circulation of air through the coolers, which is done by the use of fans, for the movement of the vehicle itself will never afford sufficient velocity to the air to adequately cool the content.

### Want Engine Hot and Fuel Cool.

Engine builders endeavor to accomplish two results—maintain the temperature of the motor as high as possible and not affect lubricity and dissipate the water from the cooling system, and draw fuel into the cylinders as cool as this can be practically done to lower the temperature of the valves and obtain the greatest degree of expansion in the combustion cham-



**Radiator with Cast Header Tanks Designed for Truck Service with Rome-Turney Cooling Section.**

ber. If the water is pump circulated, a given volume is forced through the cylinder jackets and cooler each revolution, there may be assumption that because of the greater rapidity of the circulation a constant temperature may be maintained, but as the heat is more



rapidly created it is not so well absorbed and as the surface area of the radiator is not increased there is not greater radiation except from the increase of the velocity of the air drawn through the cooler by the fan.

There is marked radiating influence from the movement of the vehicle, especially if it is driven fast, but trucks are usually driven comparatively slow, so that the radiation from the natural draft of air is much less with a given radiator surface in a truck as compared with a pleasure car. This can be in part compensated by increasing the proportions of the fan. The condition is met by using a larger radiator for a stated horsepower capacity if the engine is to be installed in a truck. The heating of an engine when a power vehicle is driven at slow speed is usually due to the lessened circulation of the air through the radiator, if the system is in other respects normal.

#### Large Ratio of Radiated Heat.

Of the heat that is generated in an engine, from 50

that is, to afford the degree of cooling that would be most efficient with a specific design and size, and are often designed to have a stated cooling area rather than any other quality, there is reason to wonder that so satisfactory results are obtained. As to radiator designing, this may be assumed by the owner to apply to the form and appearance of the case or tank, but this is inconsequential so far as actual cooling is concerned.

#### Two Classes of Radiators.

The types of radiators are usually defined by the manner of constructing the cooling section, which are extremely numerous, but they may be classified to be either tubular or cellular. The tubular may be constructed of round, square or flattened tube and the tube may be smooth or finned or gilled, although the flat tube is comparatively small section. The cellular types may be a number of short lengths of round or square tube slightly separated vertically between the rows of tube and with the spaces between the tube



Part of the Plant of the Rome-Turney Radiator Company, Rome, N. Y., with a Line-Up of Some of Its Workmen. The establishment of the Concern in 1902. These Skilled Mechanics Are Extremely Well

to 53 per cent. is radiated by the cooling system, from 15 to 18 per cent. is dissipated by the exhaust, from 15 to 18 per cent. is diffused from the engine and its auxiliaries and from 15 to 18 per cent. is converted into power. The heat losses are known to vary with the degree of cylinder compression and engine speed, but there is no principle or rule by which the variance can be determined. There are many factors that enter into the problem of adequately cooling an engine, which include size and shape of the water jackets, freedom of circulation, capacity of water pump or size of water intake and outlet, degree of lubricity, design of exhaust manifold, and to these must be added the size and type of radiator, area of cooling surface, design and construction, and, there are the influences of quality of fuel and atmospheric temperature which are extremely variable and can at best be provided for by knowledge of operating conditions.

When one realizes that radiators are not usually built to meet the exact requirements of each engine—

ends closed with solder; or the cells may be made of strips of thin sheet brass or copper that are formed so that when the edges are soldered there are small water spaces between the walls and cells through which the air circulates, so that there is large cooling area. There are different methods of forming the metal from which the cores are made, but the main purpose is to make the water spaces very thin and to expose large surface areas, so that the heat may be radiated from the water very quickly. The more rapidly the water is cooled the smaller the volume may be and the less the weight.

The volume of water required for a circulating system may be considerably smaller than that which would be necessary for a thermo-siphon or gravity system, and the former is more positive because the pump will force the water through the jackets even when the level is considerably lowered. The thermo-siphon circulation does not require a pump and is less complicated and for that reason does not need the same degree of attention, though a thermo-siphon ra-

diator must be approximately 25 per cent. larger than one for pump circulation.

#### The Location of Radiators.

The radiator is built so that it may be installed in the chassis with the top (that portion above the core or cooling section is known as the tank) considerably above the level of the water jackets, so that should the water be dissipated the cylinder chambers will be filled and the cooling efficiency will not be so reduced that there is probability of damaging the engine from excessive heating. The height of the bottom of the radiator is not of material consequence.

The location of the radiator is generally ahead of the engine at the forward end of the chassis, although the Renault construction is behind the engine and ahead of the dash. The conventional radiator must have air forced through it at a velocity proportionate to the vehicle speed, but the Renault type must have larger area to compensate for the different and less efficient circulation. The radiator ahead of the engine

But the truck radiator is an entirely different proposition. It must be made to endure and it must have the construction that will afford service in all operating conditions. The location is quite as generally ahead of the engine, although in some instances it is placed behind it, and is cooled as are the pleasure car radiators of Renault or French design. The chassis of the truck, because of the heavy loads carried, is frequently constructed to be flexible and "weave," and though the radiator is often mounted on springs or trunnions, so that there will be yield and the stresses upon it will be lessened, there is great need for the cooler to have a case that cannot be twisted or racked.

#### The Protection of Cast Frames.

This means another form of casing, and there are different types intended to safeguard the cooling section. The radiator of the truck is necessarily larger and must contain more water, for the movement of the vehicle is slower and there is not the same circulation of air forced through it by the forward movement of



Workers Are Rated by the Company as Being Exceptionally Expert, and Many of Them Have Been Employed Since the Establishment, Most of Them Own Their Homes and a Number Possess Automobiles.

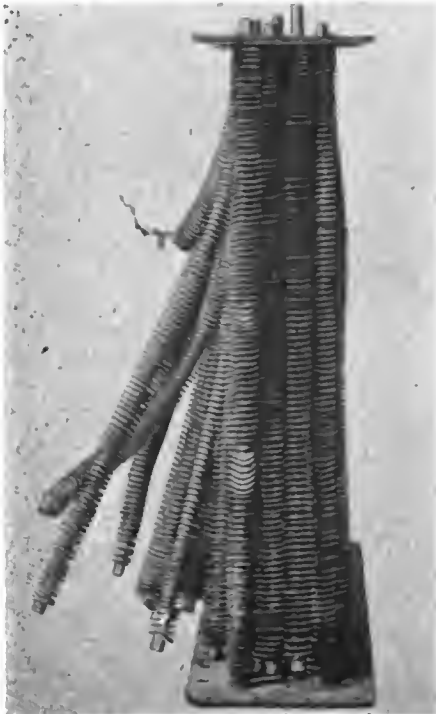
may be mounted on the chassis, in which location it is exposed to damage from accidental contact with any object and it is subjected to the twisting resulting from frame distortion.

#### Protecting Radiators Against Stresses.

In pleasure car construction the radiator may be placed directly on the frame, or it may be supported by leather or cork padding, or possibly by springs that are intended to absorb the vibratory stresses. The strains that might be disregarded with reference to any other unit may rupture the solder and cause a leak, which would possibly result in damage of the engine. The radiator cooling section may be encased in thin sheet metal that is soldered to it, the casing having spaces of considerable size below the tubes or cells, which are known as the tanks. Generally pleasure car appearance is imperative and for this reason the radiators are made as pleasing in lines and as well finished as is possible.

the machine. The fast speed of the truck is probably not greater than the average of what is regarded as the slow speed of the pleasure car, and when driven in traffic, with the very frequent stops, the engine is always more heated because of the lack of the radiating influence of the air. The weight of the radiator and its content is greater and it is subjected to increased vibration and strains.

The truck radiator is safeguarded by making the case of heavier metal, and sometimes these cases are built with top and bottom tanks, with side tanks or water columns, that are cast or pressed metal, so designed that the cooling sections can be secured in them by gaskets and bolts or cap screws. This type is preferred from the fact that should the cooling section be damaged it may be removed and another substituted without much labor, and the section taken out can be repaired, for repairing a unit radiator is work that must be done by an expert and there is the loss of the



Rome-Turney Helical Tube Radiator  
Taken from the Atterbury Plant at  
Buffalo After a Large Fire.

filled with water and the possibility of damage from strains others prefer to have the coolers carried with supports the full width of the frame, which is believed by radiator builders to be the best or safest construction. With reference to truck radiator design, this should be with regard to insuring fullest circulation of water and to obviate clogging of the passages by foreign matter that may be put into the system with the water.

Heating water ordinarily causes precipitation of organisms in it, and there are possibilities of scale from the water jackets being carried into the tank at the top, which will settle and accumulate and fill the passages of the radiator unless these are large enough to insure free flowage. The larger the water passages the less is the probability of these becoming obstructed. The bottom tank should be large enough to receive the precipitation and retain it. Some times the top and bottom tanks, if of cast metal, are finned to promote radiation. Metal castings are heavier, but they are more certain to endure.

#### Necessary Radiator Qualities.

Radiators that are scientifically built, and there is just as much need of good engineering in radiator designing as in engine building, are constructed with careful regard for the different factors stated. High quality construction requires not only fine grades of metal, but proportions that will adequately cool the engine in all operating conditions and extremely careful workmanship. Though the water in a radiator may be heated so that it will boil, there is rarely steam pressure sufficient to be a factor. The good radiator usually has an overflow pipe through which excess water may be drained from it, and unless the water is

service of the machine unless another radiator can be temporarily installed.

Many truck manufacturers mount the radiators between springs that are carried on the frame or on guides so that the road shocks and the stresses of chassis distortion may be absorbed, and others install them on trunnions, but because of the weight when

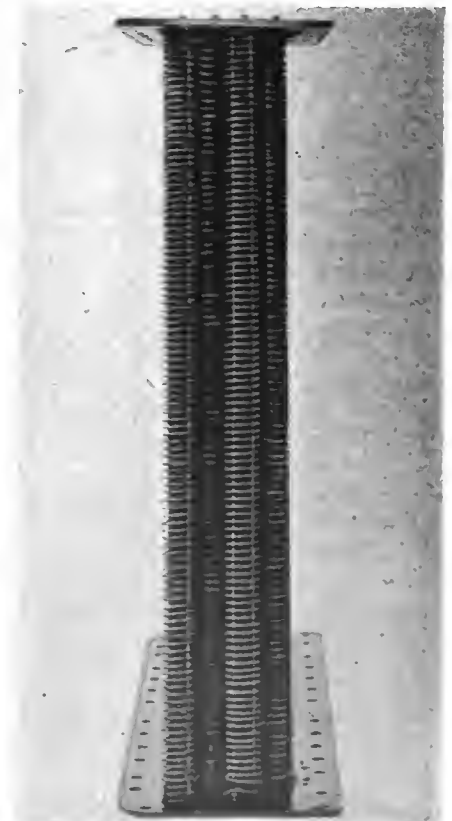
well dissipated practically all the pressure will be in the header or upper tank, which is probably the strongest part of the cooler. If the tanks are cast these will endure far greater pressure than could be obtained from steam generated by engine heat. The greatest danger is from the content freezing, which will cause expansion and generally rupture.

While not all truck radiators are specially designed for truck service, there are concerns that specialize building coolers that are intended for no other use, and the Rome-Turney Radiator Company, Rome, N. Y., is operating the largest truck radiator manufactory in America, claiming to produce a very large part of all the radiators built purposely for equipping vehicles constructed for freight carrying. This company has engaged in radiator construction for 14 years and has produced practically all types that are used for pleasure cars and trucks, but because of exclusively controlling the production of the helical tube type, it is not paying as much attention to manufacturing pleasure car radiators as in the past and specializes in helical tube and aeroplane radiators of different designs.

#### Specializes Helical Tube Radiators.

The company has a large and extremely well equipped plant and employs workers who have had exceptional training in radiator building. These men are expert and have every facility for producing high quality coolers. The company is closely affiliated with the Rome Brass and Copper Company, which is a very large manufacturer of these metals, and is in a position to obtain all materials whenever needed and can make deliveries to meet orders without possibility of delay. This has proven to be an exceptional advantage for its customers.

The helical tube radiator is given that name from the fact that the cooling section is constructed of vertical copper tube that is encircled by a helical copper fin from end to end that is sweated to the tube and which increases the radiating surface so that extremely efficient radiation can always be obtained. These

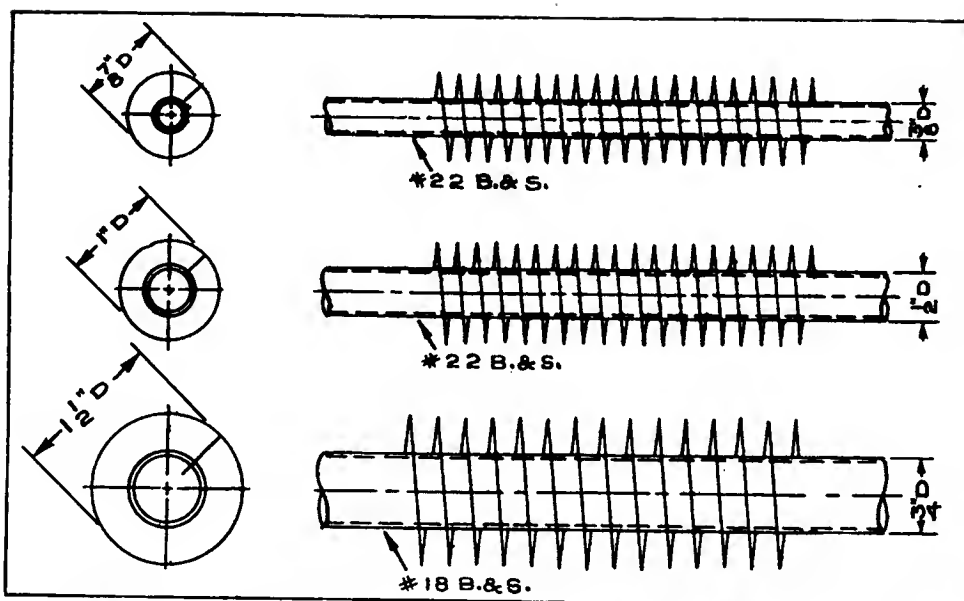


The Damaged Atterbury Radiator After  
It Had Been Repaired at the Rome-  
Turney Factory.

tubes are fitted into copper plates or slabs that are bolted to the top and bottom tanks of the radiators, and these tanks are also bolted to side members, so that the cooling section is carried in a solid frame that cannot be twisted or distorted. The tanks and side members of the frame may be cast aluminum or other metal, or may be pressed, but when cast radiating fins may be formed which diffuse the heat and at the same time strengthen the parts.

The company will build radiators complete, but it prefers to produce cooling sections only, supplying these to the vehicle manufacturers, who can have the tanks and frame members made to specification elsewhere and assemble the components, for all that is necessary is to place the gaskets between the top and bottom plates and the tanks and tighten the bolts. When the radiators are constructed in this manner the manufacturer can have the tanks in design and material to meet his own ideas and can make whatever changes may be desired at any time.

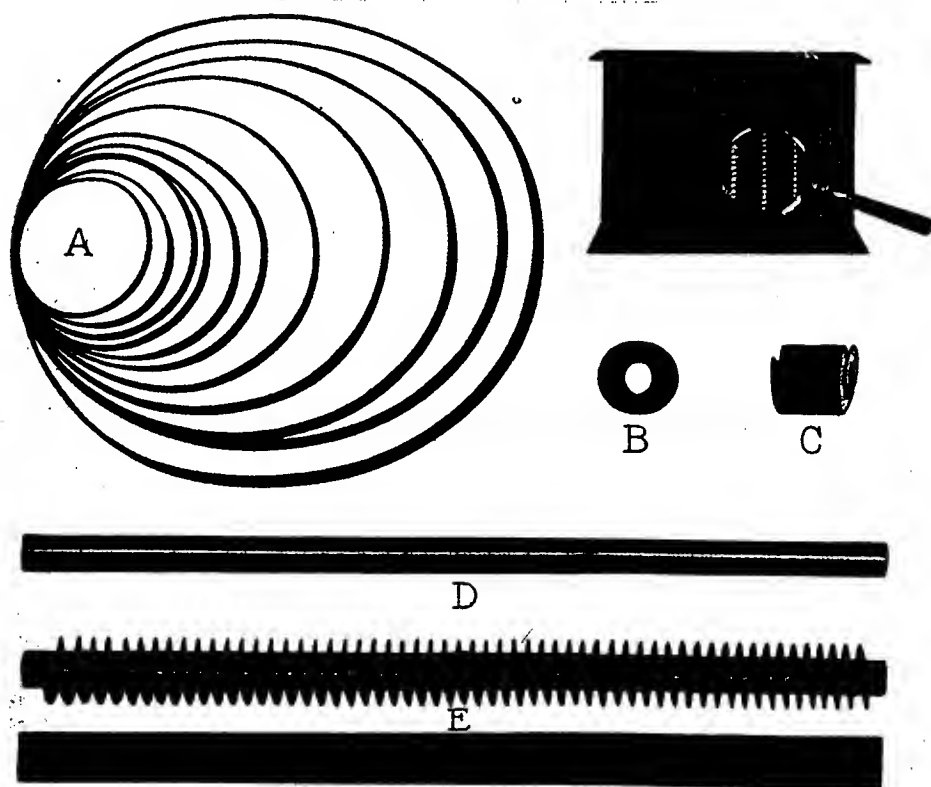
The Rome-Turney Radiator Company obtains the



Dimension Lines Showing the Proportions of the Tubes and Radiating Surfaces of Rome-Turney Helical Tube Truck Radiators.

tube cut to whatever length may be desired. The copper fin is received into the shops in the form of flattened wire that may be likened to ribbon, in large rolls or spools. The tube used is three sizes,  $\frac{3}{8}$ ,  $\frac{1}{2}$  and  $\frac{3}{4}$  inch diameter, and the walls may be from .028 to .020 thickness. The copper tape from which the helix is formed is either .010 or .012 inch thick and either  $\frac{1}{4}$  or  $\frac{3}{8}$  inch width. The tube is from 20 to 36 inches length.

In designing a helical tube truck radiator a definite area is determined. If the system is circulated by pumpage the allowance is  $8\frac{1}{2}$  square feet of cooling area for each horsepower of normal engine rating for  $\frac{3}{8}$  inch tubing, seven feet if of  $\frac{1}{2}$  inch tubing and  $4\frac{1}{2}$  feet if  $\frac{3}{4}$  inch tubing. This is worked out very carefully, the  $\frac{3}{8}$  tubing having 73 square inches of total radiating surface to the running foot of tube, the  $\frac{1}{2}$  inch tubing having 89 square inches and the  $\frac{3}{4}$  inch tube 144 square inches. One will note that there is one square foot of radiating surface to every running foot of the  $\frac{3}{8}$  inch tube, and the  $\frac{3}{8}$  inch tube has slightly more than a half square foot of radiating surface to the running foot. The proportion of radiating surface to the bare tube is 5.22 for the  $\frac{3}{8}$  inch tube, 4.73 for the  $\frac{1}{2}$  inch tube and 5.15 for the  $\frac{3}{4}$  inch tube, which shows a very consistent ratio, and the proportion of the radiating surface to the cubic inch of content is 74.5 for the  $\frac{3}{8}$  inch tube, 48.2 for



Elements of Rome-Turney Helical Radiator Tube: A, the Flat Copper Wire from Which the Helix Are Formed; B, End View of Helix After "Upsetting"; C, Helix as Taken from the Upsetting Machine; D, the Bare Tube Before Sweating on the Helix; E, the Tube Complete, the Rule Showing the Number of Convolution to Obtain Radiating Surface.

the  $\frac{1}{2}$  inch and 34.5 for the  $\frac{3}{4}$  inch tube.

With these constants the exact radiating surface of an efficient cooling section can be determined, and the length and number of the tubes of different sizes necessary for any engine and for any work accurately found. The statement relative to radiator area applies to forced circulating water systems, and if the engine is cooled by thermo-syphon circulation the area is 25 per cent. more. The aeroplane radiator, because of the positive and faster circulation of air, is but one-third the area of the truck radiator.

In the shop the tube is received in different lengths.

It is seamless drawn and the walls are uniform in thickness. It is inspected to guard against possible defects. The metal for the helix or coil is wound in rolls like ribbon, and to change its shape so that it is practically at an angle of 90 degrees to the tube it is "upset" by machines. Each roll is placed on a plate with its centre on a spindle, so that it may be unwound. The loose end is carried through a tool that is known as a "header" and clamped to a collar that is fixed on a mandrel that is turned by power. Each machine has two "headers" and two mandrels that are driven simultaneously. When the machine is operated the copper wire is wound off the plate, through the "header" and on the mandrel, the convolutions being forced in close contact, and the wire then has the appearance of a helical spring. The change is fully shown in the illustrations. This process is exclusively controlled by the company and while the description creates the impression that the process is simple, the construction of the machines was a work that required an extremely long period of experimentation before they were satisfactorily operative.

#### How the Tubes Are Finished.

When the helix are wound the bores are .002 larger than the diameters of the tube on which they are to be used. The tubes are placed in machines resembling lathes, after a section of a helix has been slipped on them. The free end of the helix is shaped with hand

cutters and made secure at one end of the tube. A tool is set that as the tube is turned separates the convolutions of the helix so that there are five full turns  $\frac{1}{4}$  inch wide to the inch of  $\frac{3}{8}$  and  $\frac{1}{2}$  inch tube and  $3\frac{3}{4}$  turns  $\frac{3}{8}$  inch wide to the inch of  $\frac{3}{4}$  inch tube. As the helix is stretched along the tube the diameter of the bore is so much decreased that the helix is firmly held. At the end of the tube the helix is cut and secured. The tube is then taken from the machine with the radiating fin in position as it appears in the radiator.

The soldering process is first dipping the tube in acid baths, and after draining they are dipped into

solder heated to approximately 600 degrees Fahrenheit. The tubes are handled with tongs by men who wear cloth gloves and masks to protect them. After dipping they are placed on a run on which they roll rapidly, the centrifugal movement throwing off the molten solder, and then they roll from the run or incline on to a grating which completely clears them of the solder. After cooling the tubes are inspected and the helix straightened if deformed in any way. They are then ready for placing in the top and bottom header plates.

These plates are made preferably of  $\frac{1}{8}$  inch copper or brass slabs that are drilled with the required number of holes (as punching would deform them and there would not be the precise fit of the tube that is desired). The tubes are placed in the holes as the cooling sections are assembled,

with the ends projecting approximately an  $\frac{1}{8}$  inch. The plates are given acid baths and coated with solder before assembling. This insures that every joint will be secured. The soldering is done with specially constructed irons and the solder is heaped from the plates to the tops of the tube, forming rings about each that are  $\frac{1}{8}$  inch thick, very securely anchoring the tubes and insuring against breakage. The cooling sections are then tested with 10 pounds air under water, and after final inspection are ready for delivery to the customer. When fitted to the tanks rubber gaskets  $1/16$  inch thick are placed between the plates of the sec-


No. \_\_\_\_\_

## "Radiator Insurance"

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# ROME-TURNEY RADIATOR COMPANY

of ROME, NEW YORK



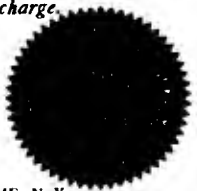
**Guarantees**

The Seamless Helical Tube Cooling Section Number \_\_\_\_\_  
installed on \_\_\_\_\_ ton truck, made by \_\_\_\_\_

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FOR THE LIFE OF THE MOTOR NUMBER \_\_\_\_\_

*This guaranty is unreserved, except as against accidental injury or freezing. If the cooling section develops leaks we will repair it free of charge.*



Dated at ROME, N. Y.  
this \_\_\_\_\_ day of \_\_\_\_\_ 19\_\_\_\_

W. L. KINGSLEY, President  
BARTON HAMILTON, Vice-President  
GEO. W. TURNER, Treasurer-General Manager  
W. L. LYMAN, Secretary



tions and the tanks, which insures against leakage.

The simplicity of this construction is especially noticeable. In the event of a tube or tubes being damaged these can be removed and replaced by new. The design has been so well proven so far as endurance is concerned that the company guarantees its radiators for the life of the engine, and then another engine. The radiators will endure very hard usage, for if a tube is broken it can be cut and the holes plugged. If there is accident that causes a leak a temporary repair can be made and the machine brought back to the garage. An example of the possibilities is shown in illustrations of a radiator that was in a fire in the plant of the Atterbury Motor Car Company at Buffalo, N. Y., which was sent to the factory a useless wreck, and of the same radiator after it had been restored.

When these sections are installed in sheet metal cases the cases are strengthened by placing in them wide strips of  $\frac{1}{8}$  inch iron that affords the necessary stiffness. However, the cast frame is approved as being the most desirable, and there is less probability of strains if the radiators are supported by studs from the bottom. The company builds some very large cooling sections, the largest being for use with gas-electric railroad cars that have 1700 square feet of cooling area.

#### ENORMOUS TRUCK DEMAND.

In a recent interview, A. L. Riker, president of the Locomobile Company of America of Bridgeport, Conn., manufacturer of Riker trucks, said that he did not believe that the threatened railroad strike had as much to do with the enormous demand for trucks as the freight embargo.

"I wish we had 200 more trucks," Mr. Riker said. "We are sold out to November and we have had to reject orders because we could not supply the demand. We are doing what we can to increase our output, but the demand keeps march with our expansion. We turned out 1600 trucks since a year ago last March, or about 100 a month. Our capacity used to be 50 trucks a year. Now it is 25 a week. That is some acceleration, but we haven't got speed enough yet."

#### MID-WINTER MEETING OF S. A. E.

The annual mid-winter meeting of the S. A. E. will be held in New York City, Jan. 9, 10 and 11, during the week of the New York Automobile Show. On the last evening of the meeting the annual dinner of the organization will be held in the Hotel Biltmore, following which the members will attend the Midnight Frolic.

W. H. Durphy has been appointed district manager of the new branch and service station of the Smith Form-A-Truck Sales Company of New York, which has been opened at 2121 Vine street, Philadelphia, Penn.

#### BAY STATE'S IMPROVED ROADS.

**Cost More Than \$12,000,000, and \$1,000,000 is Annually Spent in Maintenance.**

Col. Wm. D. Sohier, chairman of the Massachusetts Highway Commission, in a review of the work done by the commission since it was instituted by law 24 years ago, gives an interesting resume of the progress made in improving the roads in the Bay State.

Col. Sohier says: "Beginning with isolated sections on experimental or object lesson roads scattered throughout the state, the state highway system has gradually been developed into a system of main through trunk lines. The state expended over \$11,200,000 up to Dec. 1, 1915, in the construction of state highways. The counties repay 25 per cent. of this amount.

"Of the 23,000 miles of roads in Massachusetts, over 18,000 miles would be marked 'improved' in most states. To be sure 11,000 miles are still dirt or gravel roads, but they have been graded or drained and are in reasonably passable condition.

"Over 7500 miles are good gravel roads; about 3000 miles plain macadam, but almost all of our gravel and macadam roads have now been coated with some bituminous material to prevent them from being torn up by automobiles.

"The highway commission is trying not only to widen all the roads from the standard width of 15 feet to at least 18 feet of hardened surface, but also to diminish the crown and make the roads stronger at the same time. It is improving the views around the corners and curves and widening the curves out to 21 to 24 feet and banking them whenever possible.

"In 1912 the legislature made \$1,000,000 a year available, this sum to be spent each year for five years, and in 1915 an additional \$2,000,000 was appropriated to be spent in connecting some 26 of the small towns in the five western counties with the main roads. Over 120 miles of road will be built under this act.

"Many miles of the state highway system are over 12 years old and some are over 20, and they are still carrying the traffic and are in reasonably good condition. They require, however, constant maintenance and very nearly a million dollars a year is being spent in improving, maintaining and resurfacing these roads, coating them with tar or oil and keeping them shaped and patched.

The Horner truck, made by the Detroit-Wyandotte Motor Truck Company of Wyandotte, Mich., is being handled in the metropolitan district of New York by West & Maginnis of 1790 Broadway.

The distributor of the KisselKar line of trucks in New York, the Crown Motors Corporation, has secured new quarters at 140 and 142 West 42nd street.

## FEDERAL STATE ROAD AID.

### Secretary Houston Explains How Law Will Be Interpreted and Applied.

Secretary of Agriculture, David Franklin Houston, discussed the important features of the new Federal aid road act at a meeting of the state highway officials held last month in Washington for the purpose of talking over tentative rules and regulations for carrying out the act.

Secretary Houston in the course of his remarks said: "This law appeals to me as of special importance, not so much because it carries with it out of the Federal treasury an appropriation of \$85,000,000, not because it will be met by an appropriation of \$75,000,000 or more out of state funds, if all the states accept the act, but because as great as is the aggregate, it is relatively insignificant in comparison with amounts the states are now annually expending and will spend during the period covered by the act.

He also said that the main question was whether or not the nation would get a dollar's worth of results for every dollar expended. If this question should be answered in the affirmative, according to the secretary, the people would be ready to put more money into good roads where they are needed and to accomplish this skillful and experienced men should be placed in charge of the road building that is to be carried out under the act.

"This act will necessitate trained intelligence in the service of the state as well as in the service of the Federal government," said Secretary Houston. "The act requires the state to accept it. That is, as I understand, it implies the assent of the state to every provision of the act. One of these provisions is that projects, plans, specifications and contracts shall be submitted by the people who know about such things. So the assent of the state involves the calling of trained men into the service of every state which is now without them.

"The law involves another thing, the pledge of the state to meet in full the Federal appropriation for the entire period covered by the act. The state legis-

lature may not be able to appropriate money one year for the whole period covered by the act, but it can pledge the faith of the state to meet the financial provisions of the act for the period covered by it.

"The provision that where the state may not engage in highway improvement the money may be secured if counties raise an amount sufficient to meet the apportionment to the state, involves the necessity on the part of such counties of raising an amount sufficient to meet the full apportionment of the state, the existence of a highway commission, and compliance with all the other terms of the act. I speak of this because there are evidences that individual counties think that, if they raise a certain sum of money, they will of necessity get a corresponding sum from the Federal treasury. That is not my construction of the act and not the one that will be likely to prevail.

## BOSTON AUTOMOBILE SHOW.

The 15th annual Boston Automobile Show, held under the auspices of the Boston Automobile Dealers' Association, Inc., and the Boston Commercial Motor Vehicle Association, Inc., will take place in Mechanics' building, Boston, from March 3 to 10 inclusive. The exhibition, which is for pleasure cars, commercial vehicles, motorcycles and accessories, will be under the management of Chester I. Campbell, 5 Park square, Boston, Mass.

## INCREASE OF DUTY ON AUTOS.

The duty on automobiles—excluding trucks—entering Ceylon has been increased from  $5\frac{1}{2}$  per cent. to  $33\frac{1}{3}$  per cent. This rate has become effective immediately according to advices received by the Department of Commerce from the American vice consul at Colombo, Ceylon.

## SALES ORGANIZATION CHANGES.

A number of changes have been announced in the sales organizations of the Kentucky Wagon Manufacturing Company and the Dixie Motor Car Company of Louisville, Ky., of which Robert V. Board is president.

W. I. Shaw, who has been sales manager of both companies, has been appointed general sales manager, and Stephen K. Miller, who has been assistant sales manager, has been made sales manager of the wagon department. Frank H. Homan has been appointed sales manager of the "Old Hickory" gasoline truck department, and A. B. Challinor sales manager of the pleasure car department.



Old Hickory Truck, Load Capacity 1250 Pounds, Latest Product of the Kentucky Wagon Company, Louisville, Ky.

**TORBENSEN AXLE COMPANY'S OFFICERS.**

The stockholders of the Torbensen Axle Company, which recently took over the assets and business of the Torbensen Gear and Axle Company, a New Jersey corporation, held a meeting and elected directors for the ensuing year on Sept. 13. The new company was recently formed under the laws of Ohio with an authorized capital of \$1,000,000 of preferred and \$750,000 of common stock. Of this amount \$500,000 of preferred and \$395,000 of common stock have been issued, leaving \$500,000 preferred stock and \$355,000 of common stock in the treasury to be used for future expansion of the business. In addition to paying for the old company, this financing plan has also left \$340,000 additional working capital.

The company's main plant is at 1115 East 152nd street, Cleveland, where a site of four acres with a number of buildings was recently purchased. A new machine shop of 20,000 square feet area and a warehouse of about 10,000 square feet have been added to the plant.

The directors elected at the recent meeting were: V. V. Torbensen, president; W. J. Baxter, vice president; J. O. Eaton, treasurer; A. H. Ide, secretary, and S. H. Tolles. W. F. Rockwell has been appointed works manager, R. A. Bruce, sales manager, and C. I. Ochs, purchasing agent.

**GMC TRUCKS IN TEST RUN.**

A 3½-ton GMC truck loaded with 7400 pounds of cement made a perfect score in the truck endurance contest held over the route from Los Angeles to San Diego, Cal., under the supervision of the A. A. A. The route was 142 miles in length, with the roads in bad condition in many places.

**CONTRACT FOR U. S. MAIL TRUCKS.**

The Commercial Auto Body Company of St. Louis, Mo., has been awarded the contract covering the requirements of mail trucks of ½-ton capacity for the United States Postal Department. The announcement of this fact did not state the number that would be required, but the contract runs up to and including June 30, 1917.

The Commercial Auto Body Company makes a specialty of building commercial bodies for Ford chassis. The trucks to be furnished under the contract will consist of Ford chassis with demountable rims, special mail type bodies as per government specification and will be painted mail blue with proper inscriptions and U. S. mail monogram on sides.

**FIGHT FOR CONTROL OF CROCE COMPANY.**

Louis P. Croce of Asbury Park, N. J., has secured from Vice Chancellor Stevenson a rule to show cause why the directors of the company should not be restrained from taking title to \$33,500 capital stock of the Croce Automobile Company of Asbury Park.

Mr. Croce alleges that the board of directors of the company is endeavoring to deprive him of control of the company. At a meeting on Aug. 2 \$33,500 capital stock of the company was placed in the hands of a trustee as security for \$25,000 which three of the four directors loaned the company and for a note taken on behalf of the company which the four directors indorsed. Croce holds \$22,600 out of a total of \$37,500 original capital stock of the company.

In addition to asking that the board of directors be restrained from claiming title to the newly issued stock, Croce also asked the vice chancellor to restrain the trustees from voting the stock. The directors of the company besides Mr. Croce are Samuel A. Reeves, president; Harry A. Watson, secretary; Albert Robbins and John Stein.

**MOTOR AND ACCESSORY SHOW.**

The Motor and Accessory Manufacturers, Inc., New York City, has sent out literature and application blanks for space in the New York and Chicago shows. C. E. Thompson, chairman of the show committee, says there is great enthusiasm over the coming shows and he doubts if there will be enough exhibition space to meet the demands of the accessory manufacturers who will apply through the organization.

P. L. McKinney has opened an agency for Peerless trucks in Manchester, N. H. He will handle this well known line in that state and Maine as a dealer.

The 23rd annual convention of the American Society of Municipal Improvement will take place at Newark, N. J., Oct. 9-13.



Gramm-Bernstein Trucks Parked in a Field Close to the Factory Because of the Lack of Storage Buildings.

## UTILIZING MOTOR TRUCKS FOR FARM WORK.

**R**APID evolution resulting from use of motor trucks has influenced every phase of the farmer's life, as well as revolutionized methods that seemingly made farming little more than drudgery. Use of trucks has made easy the heavy tasks, lessened the burdens which overtaxed every farmer and these vehicles have proven to be humanitarian wherever they have been fitted into the plan of agricultural work.

When the farmer who uses a truck has ended his day's work he no longer spends half an hour in his barn unharnessing, feeding and bedding the stalls for the horses. He does not have to arise an hour earlier in the morning to feed his horses and harness them. When occasion demands overtime work he is not handicapped by a limited number of horses or by the feeling that his horses can stand no more work that day, as the truck can be worked continuously, yet overtime work is seldom necessary, as he accomplishes more in a day with his truck than he could with three or four horses.

The truck is not limited in use to hauling loads

When the farmer takes his produce to market, if living within 25 miles of the city, town or village, he need not ride the greater part of the night behind slow moving horses, but can start at a reasonable time in the morning and get to market earlier than his neighbor who started hours before. If he has shopping to do he can stay later at the market, as 20 miles means a drive of an hour and a half, while with a pair of farm horses a round trip of that distance would require from seven to nine hours.

He will have more time to himself Sundays and can take his family driving. Many trucks sold for farm purposes have body equipment for transforming them into passenger carrying vehicles, and are often used by farmers living near lively railroad stations for carrying passengers and baggage to and from the trains.

### Uses Are Greatly Diversified.

Where a farmer has use for a heavy duty truck he gains many advantages, as these machines can have bodies designed to transport weighty freight and loads



Two Practical Examples of Using Trucks on Farms: At Left, Carrying a Cow in a Crate in a Light Truck; at Right, Hauling a Bulky but Light Crop of Fodder from the Field to the Barns

over a roadway, as is a general impression obtaining, but may be utilized in many works and for widely differing services. It also reduces the number of hands necessary and in their stead a much higher grade man is employed. He is not only educated and refined in comparison with the ordinary farm worker, but can teach the farmer and his sons practical knowledge of mechanics. The farmer learns that he can produce greater income from his estate or farm by using other agents than his manual skill and can devote more time to his family, and to educational and social duties.

### Records Prove Truck Economy.

Records so far kept of the operations of trucks on farms have shown in practically every case that they were economical as compared with animal power. The utilities of trucks are manifold, particularly if they are convertible types and their uses are limited only by the character of work the owner has to do. The best type of truck for the farmer, of course, is that which has been designed to meet the greater number of his needs.

of great bulk, such as hay, corn fodder, wheat and the like. Loads that could not be drawn by four horses can be carried 10 miles in one-fourth the time with trucks. In addition to carrying the various crops to market the trucks are utilized in hauling soil, fertilizer, tools and implements about the farms, and they are used for moving trees, plants, shrubbery and cattle.

It would be almost impossible to enumerate all the various uses which may be made of trucks on modern farms. Aside from their hauling capacity and in road work the machines are adapted to stationary power purposes by many owners, operating water pumps, wood saws and other machinery. They can also be used to draw plows or operate threshing machines.

On large estates they have the greatest usefulness, displacing large numbers of horses, special machinery, farm hands, station wagons and obtain a great economy in stable space. The improved sanitary condition is another quality that is favorably regarded, and the truck has to be fed and watered but once a day, an

operation that takes a very brief period, while feeding water and caring for several horses will require several hours a day.

#### White Company's Farm Trucks.

The White Company, Cleveland, O., was one of the first truck manufacturing concerns to recognize the need of a specially designed machine for use on farms and country estates, and it built four different types of vehicles for this service. These are three-quarter-ton and the 1½-ton in light service combination trucks, and three-ton and five-ton in the heavy duty vehicles.

With a single or double drum power winch equipment these heavy trucks are used for clearing land, loading or unloading heavy material, for hoisting or the many other services for which such an equipment is applicable. Furnished with a dumping body they can be used very economically in the handling of sand, brick, cement, stone, gravel or coal. Full loads may be dumped in less than 30 seconds with these bodies.

The most useful and satisfactory description of the utility of the truck is found in the actual experiences of users. A five-ton White truck on the estate of Stedman Bent of Philadelphia, Penn., was used to haul and relocate a large oak tree, which was carried a distance of 42½ miles. The tree was 40 feet high and 13 inches in diameter at the

A number of estates use White trucks for moving cattle from place to place. Among these are the Ferndale farms at Auburndale, Mass., and E. H. Baker, owner of the Keewaydin farms at Gates Mills, O. Mr. Baker sent 16 head of cattle from Gates Mills, O., to a fair at Randall, O., in one three-ton White truck in a single day. The Wellington Stock Farms at Wellington, O., and the Rocky Point Farms at Plymouth, Mass., also use White trucks for transporting live stock.

#### How Buying Is Stimulated.

Throughout the country there are thousands of farms using trucks and the only reason that their use is not more general is the bugaboo of the first cost. The average farmer cannot at first see returns on the required investment, but should his neighbor begin using one and operates on a large scale, obtaining more productive results with less labor, he soon becomes interested. There is now no doubt as to the economy of a truck if it is handled intelligently. This cannot only be proven in theoretical farming, but also in actual demonstration.

A New England farmer whose property is located on a beautiful pond six or seven miles from a summer resort, had been limited for years to growing small crops of garden truck. Then he established an ice



Where the Saving of Time Is Large Economy; at Top, Loading a Cow from a Truck in Which It Was Taken from the Farm to a Fair; at Left, Handling Sacked Vegetables from the Field to Market; at Right, Cultivating a Field with a Truck.

butt. It was loaded on to the truck with about 8470 pounds of earth about the roots, and the total load, including tree, tackle, etc., was about 10,470 pounds.

#### Utilized on Large Estates.

A truck operated by George L. Carnegie's estate at Jekyll Island, Ga., covered 6498 miles hauling fruit, at a cost of \$586, including all expenses. Another White truck owned by Joshua Crane of Westwood, Mass., has traveled 31,274 miles in two years.

Three White trucks on George J. Gould's estate at "Georgian Court," Lakewood, N. J., do all the hauling and transport the baggage, express, freight or any other material arriving at or leaving the Gould property.

The White truck used by Mrs. E. H. Harriman at her estate is equipped with a convertible body for passengers, baggage and freight. A three-ton White dumping truck is used by the Yakima Orchard Company of North Yakima, Washington, for hauling fertilizer to the orchard and hops from the orchard to city of Yakima, a distance of nine miles.

business in the summer resort, as this had better prospects than farming. To reach his market with sufficiently large loads to make the business profitable he had to seek other means of haulage than horses. The roads were not particularly good between the ice house and the market and were quite hilly. This condition was discouraging until he purchased a three-ton truck with which he could make quick trips carrying full loads. As the business grew he placed his horses in the village for delivery purposes and used the truck solely for carrying the ice from the pond. Three months after the first truck was put in operation the increase in business necessitated his buying a second truck. In this case the entire business was made possible by the truck, as without it, owing to the nature of the product, deliveries could not be made in sufficient volume and quickly enough to be profitable.

The Federal Motor Truck Company, Detroit, Mich., has appointed V. K. McBride, who has been connected with its sales department for two years, to be assistant sales manager.



### F-W-D TRUCKS IN CALIFORNIA.

The agent of the F-W-D truck in San Francisco has a letter from an owner of a five-ton F-W-D truck operating in the "big tree" country, which he prizes highly as a testimonial. Knowing that the conditions in which the truck was to be operated were very unusual, the agent wrote the purchaser to satisfy his curiosity as to what results were being obtained. The answer received was in part as follows:

"The truck is more of a success than I thought possible. I am hauling over a road that a 10-horse team can only pull  $4\frac{1}{2}$  tons, taking five days to make the round trip. The truck makes the round trip in 14 hours with  $3\frac{1}{2}$  to four tons.

"People from the whole country for miles around come to see the only truck that ever reached Wawona with four tons. The first load was 8152½ pounds, for which I have a receipt from the Associated Gasoline people. Since then I have been making regular daily trips from Raymond.

"The truck has replaced one 10-horse and two four-horse teams on the road."

### TRUCKS TRANSFER TROOPS.

What was probably the most thorough and extensive test ever made in transporting troops in this country by motor truck took place recently under the direction of United States army officials in Texas. The First and Second Kansas Infantry regiments, with their equipment, were entrained on a fleet of 124 trucks at Eagle Pass, Tex., and sent to San Antonio to take the place of the Illinois troops which were ordered North. The distance between the two places is 175 miles.

### FEDERAL TRUCK IN RESCUE WORK.

A Federal two-ton truck, owned by the Verdi Lumber Company, a Nevada corporation, recently was put in service on a rescue mission during a disastrous fire at Verdi, 11 miles out of Reno. The truck carried out a detachment of militia, arriving in 55 minutes after leaving Reno. The truck was used to assist the homeless residents in transferring the household goods they had saved to places of safety and later in bringing food and supplies to them from Reno.

The 14th annual convention of the American Road Builders' Association, the seventh American Good Roads Congress and the eighth annual national show of Road Building Machines and Material will take place at Mechanics' Hall, Boston, Mass., Feb. 5-9, 1917.

The Blair Motor Truck Sales Company has opened an agency for Blair motor trucks at 60 East Spring street, Columbus, O.

### PIERCE-ARROW A LARGE ECONOMY.

A five-ton Pierce-Arrow truck, used by Winslow Brothers & Smith of Boston, Mass., has saved over three times its cost during the past three years it has been in use and has furnished far more satisfactory service than the concern obtained by using the freight lines.

During 1915 the truck moved 3,916,400 pounds a distance of 12,994 miles, at an operating cost of \$5252.95, which amount was \$5425.87 less than the same service cost when it was handled by freight cars. The truck was in active service 295 days, with an average operating cost per day of \$17.77, or \$.4034 per mile. The distance covered for the round trip is 30 miles and a total of 608 trips were made.

### TO PROMOTE ELECTRICAL TRADE.

R. A. Lindquist, a consulting engineer of Milwaukee, Wis., is now consulting with American manufacturers and exporting firms preparatory to making a trip to China, India, Australia, South Africa and the other countries in the Far East to find markets for American electrical goods. The work is being carried out under the auspices of the Bureau of Foreign and Domestic Commerce, Department of Commerce.

There is thought to be a big opportunity to develop the electrical export business in those countries, as while formerly the American manufacturer met with strong competition there, selling since the war the opposition has decreased considerably.

### BIG ORDER FOR WHITE TRUCKS.

An order for 50 White five-ton trucks has been placed with the White company by Stedman Bent, a well known contractor of Philadelphia, Penn. This is one of the largest orders ever given by a single firm operating in only one section of the country, but much larger orders have been made by companies like the Standard Oil Company, Armour & Co. and other concerns whose operations cover the entire country.

### MANY MORE TRUCKS IN MAINE.

Registration figures in the State of Maine from Jan. 1 to Aug. 1 show that there were 1834 commercial vehicles licensed as against 1096 during the corresponding period in 1915. This increase of 736, or over 70 per cent., is largely ascribed to the improved road conditions and the prospects of further extensions of the highway system.

A new plant for the Goodyear Tire and Rubber Company to be erected at Toronto, Ont., Canada, at a cost of \$750,000, is under consideration of the officials at Akron, O.

### H & N COMPANY BUYS NEW PLANT.

The "H & N" Company, manufacturer of the "H & N" carburetor, has purchased a new plant at 138 West avenue, Long Island City, close to the Queensboro bridge, Steinway tube and 34th street ferry.

The main office and retail sales department, which are now located at 1675 Broadway, between 52nd and 53rd streets, will be removed in the near future, although the service station located at 38 West 62nd street, one door west of Broadway, will be maintained and enlarged. The concern at present has its own branches in Boston, Philadelphia, Los Angeles and Detroit.

### OPENS BRANCH OFFICES.

The Philadelphia Storage Battery Company of Philadelphia, Penn., has opened offices in Detroit, Atlanta and Los Angeles.

The Detroit branch is in charge of Peter Kain and is located at 1107 Kresge building. D. J. MacKillop, who was formerly at the Chicago office of the company, is in charge of the Atlanta, Ga., office at the Hotel Ansley in that city. The Los Angeles office at 1105-7 W. Pico street is in charge of C. L. McWhorter, who was formerly at the Denver office of the company.

### WHITE COMPANY TO BUILD.

The White Company, which has had offices and sales rooms at Broadway and 62nd street, New York City, for over 10 years, has leased a plot of land on the northwest corner of 57th street and Park avenue, where it will erect a building of its own to be used as offices and sales rooms. The leases run for 21 years, with renewal privileges and option to purchase. The new building will be five stories high and of exceptional architectural design.

This announcement caused considerable comment in New York trade circles, as this is the first large automobile concern to move from Automobile Row, where most of the retail automobile establishments have been concentrated for 10 years.

R. H. Johnston, New York manager for the White Company, in speaking of the relocation of the sales rooms and offices said: "We regard the location which we have selected as the best in the city for our company. It is generally admitted that 57th street is rapidly becoming the ideal location.

### REO COMPANIES COMBINE.

The two Reo companies of Lansing, Mich., well known manufacturers of pleasure cars and trucks of that name, which are already identical in ownership to a large extent, are to be combined under a plan involving the exchange of the stock of the Reo Motor Car Company for that of the Reo Motor Truck Company on an equal basis.

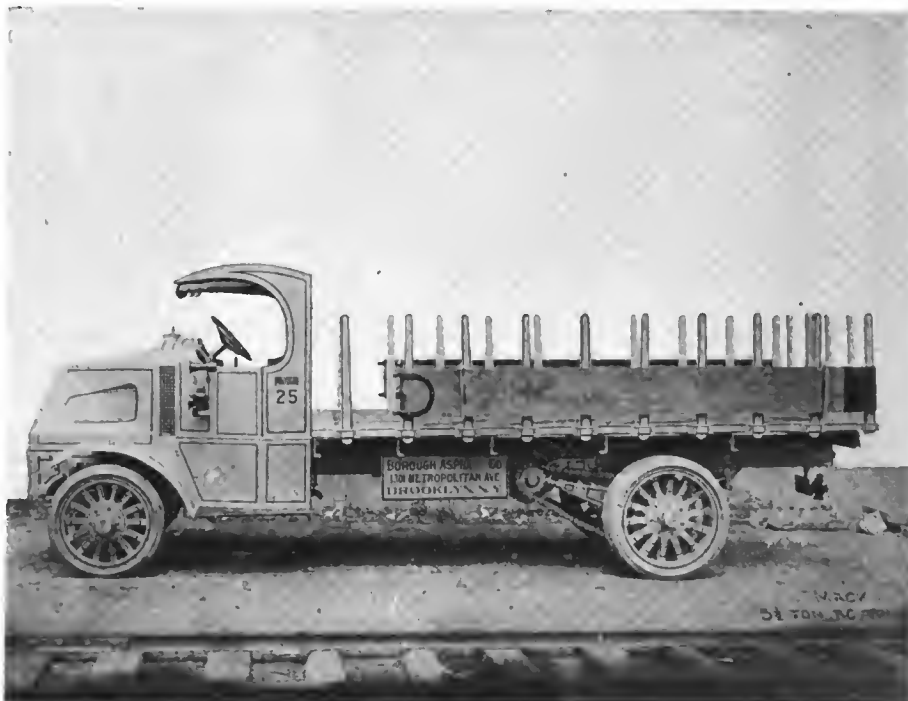
By the consolidation of the companies a more efficient organization can be effected to operate the rapidly increasing business of the two concerns. The same organization has been handling the affairs of both companies separately and it is believed that many economies both in time, money and labor may be effected by conducting the business as a single unit.

Plans for expanding the productive capacity of the plants have been made and the Reo Motor Car Company has purchased a site covering three city blocks, south of the Grand Trunk railroad, extending to the Michigan Central freight yards.

### ENORMOUS TRUCK EXPORTS.

During the fiscal year ending June 30, 1916, a total of 21,265 commercial vehicles, valued at \$56,805,548, were exported from the United States as compared with 13,996 during the corresponding period in 1915, of a value of \$39,140,682. During the fiscal year ending June 30, 1914, the exports of commercial vehicles totaled only 784, with a valuation of \$1,181,611.

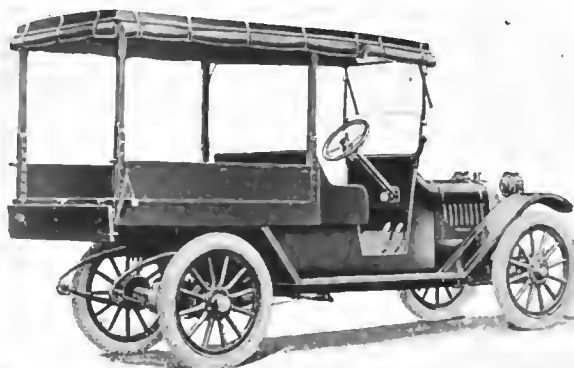
In July of this year there was marked falling off in the exports of trucks, only 1243 being shipped as against 2469 during July, 1915.



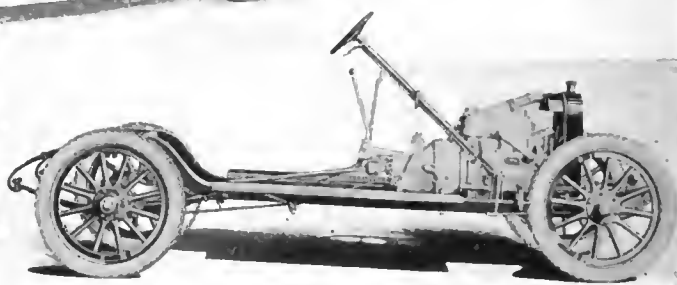
Mack 5 1/2-Ton Truck, the Chassis Being Equipped for the Borough Asphalt Company, Brooklyn, N. Y., Which Has a Fleet of Similar Trucks Now in Service.

## SHERIDAN LIGHT DELIVERY WAGONS.

**T**O PROVIDE a light, economically operated machine intended for rapid city and suburban deliveries of small parcels is the purpose for which the Sheridan light delivery wagon was designed and is manufactured by the Sheridan Commercial Car Company, Chicago, Ill.



four inches, developing 22 horsepower at 1800 revolutions per minute. The automatic carburetor is attached to a combination intake and exhaust manifold, and takes air from a pre-heater on the exhaust pipe, so that the mixture is doubly heated before entering the cylinders. The valves are on one side



The Sheridan Light Delivery Wagon: Above, Equipped with a Four-Post Standing Top, with Curtains, on an Express Body; at Left, Top View of the Chassis, Showing Power Plant and Transmission System; at Right, Side View of the Chassis.

The use of motor vehicles for delivery purposes is rapidly extending to the smaller tradesmen, handling light goods, such as florists, jewelers, butchers, shoe stores, etc., but in the case of many of them, the average delivery truck is unnecessarily heavy and expensive in proportion to the loads while, on the other hand, the motorcycle, with carrier, does not come up to the requirements.

The Sheridan delivery wagon fills the gap between the two types, but is a compromise only in the matter of carrying capacity and price, as its design includes all the refinements found in cars of conventional size and selling at a substantially higher price.

### Four-Cylinder En Bloc Engine.

The specification comprises a very neat four-cylinder engine, cast en bloc and incorporated to form a unit with the gear set and clutch assembly; double universal propeller shaft; full floating rear axle; pressed steel frame and other features which mark it as quite up to date in all respects.

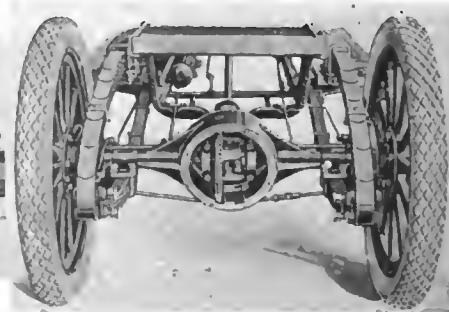
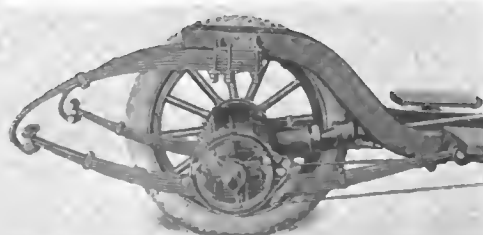
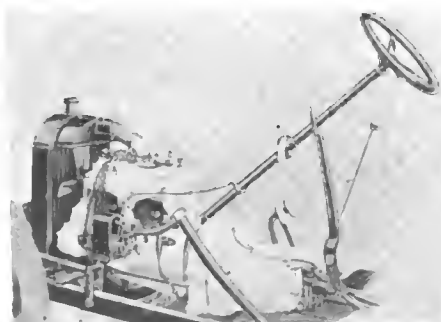
The cylinders have bore of  $3\frac{1}{8}$  inch and stroke of

and are fully enclosed. The splash lubrication is maintained at a level by a reciprocating circulation pump, with overflows from the crank case to the sump basin. The high-tension magneto is a Bosch.

Thermo-syphon cooling is employed, having the natural circulation facilitated by extra large passages connecting the jackets to a vertical tube radiator, which embodies an auxiliary tank to compensate for evaporation. The belt driven fan has eccentric belt tension adjustment.

### Multiple Disc Clutch.

Internally cut teeth in the rim of flywheel serve to engage the driving plates of a multiple disc clutch. This makes the plates considerably larger in diameter than are ordinarily found in clutches of this type, and is a commendable improvement. The gear set contains three forward speed ratios and reverse, with selective control, the shifting lever being mounted on the inspection cover, as is also the hand brake lever. Right hand control has been adopted, evidently with the idea of giving the driver quick access to and egress



Some Components of the Sheridan Light Delivery Wagon: At Left, the Forward End of the Chassis, Showing the Power Plant and Steering Gear; at Centre, Rear Axle, with Wheel Removed, to Show the Spring Suspension and Brake Construction; at Right, the Rear Axle with Inspection Cover Off the Differential Gearset Housing.

from his seat. The emplacement of the power plant in frame is by a three-point mounting.

The very robust looking rear axle has the banjo type of housing, with a large inspection cover at the rear, and a removable front plate carrying the differential assembly, and having a tubular extension which carries the pinion shaft in two Hyatt roller bearings. The drive shaft, flexibly connected at front and rear, does not take torque reaction, nor does it transmit forward drive from axle to frame, both of these efforts being taken by the rear springs.

#### **Three-Quarter Elliptic Spring.**

The latter are three-quarter elliptic, with the lower half slung under axle, which is a full floating type. The hand and foot brakes are both applied to drums on the rear wheels, being externally contracting and internally expanding respectively.

The front axle is an H section drop forging, heat treated. The forward end of the pressed steel frame is suspended from the front semi-elliptic springs, so that it passes under the front axle. At the rear, on the other hand, it has a pronounced kick up, in order that the floor of body may be brought to a convenient height from ground. The steering gear is a pinion and sector type. The wheel sizes are 31 by 3½ inches, shod with non-skids all round. The wheelbase is 104 inches and the tread 36 inches.

The lightly constructed but serviceable body is of express type, with side and storm curtains which, with the folding windshield, completely enclose it when desired.

The price of \$540 includes a complete equipment of lamps, Prest-O-Lite tank, tools, etc., while the chassis alone sells for \$490.

### **BIG GOODRICH EXPANSION PLANNED.**

Plans have been prepared by the B. F. Goodrich Company of Akron, O., for the erection of a new group of buildings as an addition to the present plant at a total cost of over \$500,000. One of the buildings will be six stories in height and will cost \$415,000, and two others of one story each, will cost \$44,000 and \$38,000 respectively.

### **KISSEL FACTORY EXPANDS.**

Two new factory buildings are being added to the plant of the Kissel Motor Car Company at Hartford, Wis. These buildings will provide 14,000 extra square feet of floor space, making a total of 60,000 in all added to the plant's floor area this year.

The Abbott-Downing Company of Concord, N. H., will open sales rooms on Brookline avenue, in Boston, for the distribution of truck bodies. This concern is one of the oldest wagon manufacturing firms in the United States and for some time has been contemplating the manufacture of complete motor trucks.

## **GMC TRANSCONTINENTAL TRIP.**

### **Milk-Laden Truck Driven From Seattle, Wash., to New York in 31 Days.**

What is probably the first transcontinental trip ever made by a motor truck of so small a size with a load of merchandise was made by a 1½-ton GMC machine carrying a load of one ton of condensed milk. It was driven from Seattle, Wash., to New York City by William Warwick and the trip was made to carry out an idea of the members of the Seattle, Wash., Chamber of Commerce.

Mrs. Warwick was the only passenger on the truck, which made the journey in 31 days actual running time without any serious mishaps or experiencing any trouble with the machine despite the fact that the roads through all the western states were anything but good, owing to the flooded conditions in many places. In some routes the water was hub deep and throughout the entire drive the party never had a period of 24 hours time without rain. The total distance covered was 3710 miles. The average day's run was 119.67 miles.

Upon its arrival in New York the party was met by Manager C. B. Warren of the General Motors Truck Company's metropolitan office and the group was soon surrounded by a large gathering of interested automobile men. Hundreds of signatures had been written on all parts of the truck by people met during the journey and the truck with its load attracted no end of attention because of the evidence upon it of the drive from coast to coast.

The journey, which was made primarily for the purpose of demonstrating to eastern people that the National Parks Highway is a great artery of travel, and as such is worthy the consideration of those who contemplate extended western journeys by motor vehicle. If a well loaded truck could go through there was no question of the possibilities with a touring car, even of small power.

### **ANNUAL FIRESTONE OUTING.**

The annual outing of the officials of the Firestone Tire and Rubber Company was held at the home of Amos C. Miller, Castalia, O., and was attended by a party of 225, including also foremen and superintendents of the big Firestone plant. Mr. Miller, who is vice president of the company, acted as host while the party was at his farm and later when it journeyed to Cedar Point, near Sandusky, President Firestone became the host.

The Redden Boston Sales Company, with headquarters at 755 Boylston street, Boston, will handle the Redden line in that city. J. B. McMahon, Jr., and N. J. Wallis, the latter of Boston, organized the new firm.

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# The MOTOR TRUCK

*Devoted to Motor Driven Business  
Vehicles of all Classes*

Pawtucket, R.I.

Vol. VII. No. 10.

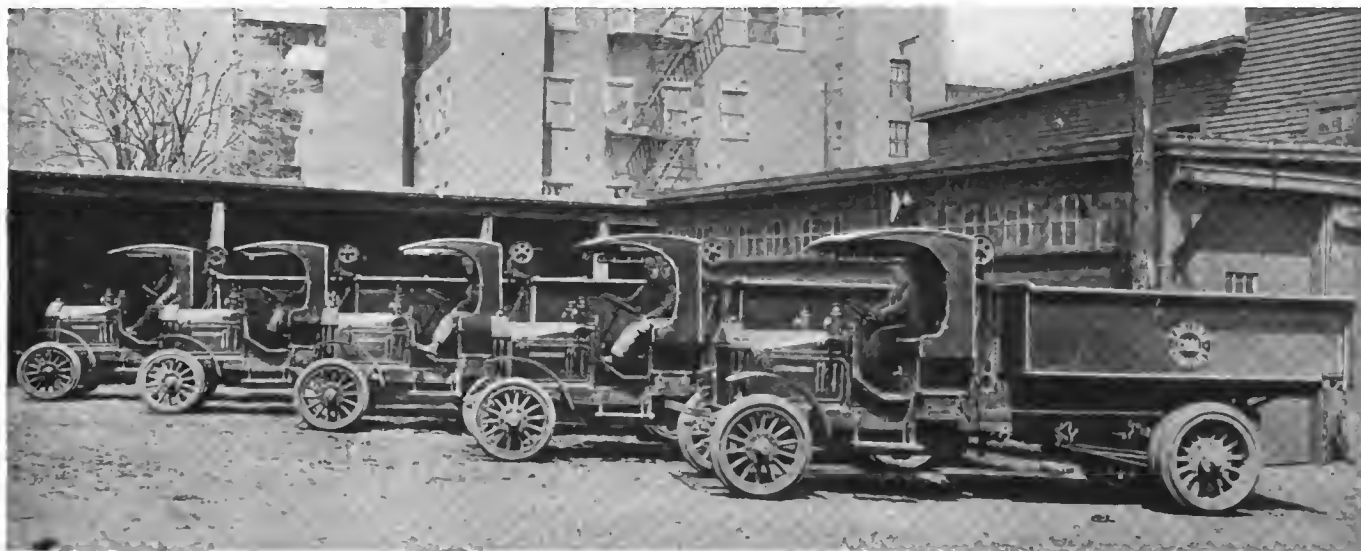
OCTOBER, 1916.

## TRUCK VALUE DEPENDS ON TIME ECONOMIES.

**Eastern Coal Company, Largest Rhode Island Dealer, Buys Eight Five-Ton Machines, Reduces Horse Equipment 50 Per Cent. and Increases Haulage 30 Per Cent.—  
How Delivery Experiment Developed Real Savings.**

CONVERSION from animal wagons and carts to motor trucks is not often quickly brought about by coal companies from the fact that practically all concerns engaged in the distribution of fuel have from experience realized the loss of time that is seemingly inevitable, no matter what the equipment or the organization for utilizing it. Yet the Eastern Coal Company, one of the largest distributors of

This experience is decidedly unusual because the companies engaged in coal trade with rare exceptions want to experiment extensively, the supposition being that no matter what results may be obtained by others these cannot be accepted or applied generally to any specified enterprise. Almost universally there is disposition to discount the value of records to determine whether or not anticipated economies are being realized.



Five of the Fleet of Eight Pierce-Arrow Five-Ton Trucks in the Service of the Eastern Coal Company, Largest Operator in Rhode Island, at Providence.

Rhode Island, located at Providence, has purchased eight five-ton Pierce-Arrow trucks in 15 months and has reduced the animals in use from 140, the number it worked for several years, to 72 in that period. Not only that, the company is now doing work that could not be done with 200 animals, according to the statement of its superintendent, and it is not working its machines overtime to any great extent.

Its own accounting established the confidence of the company in trucks after the first machine was installed.

The Eastern Coal Company has been established for years and operates three large yards located on the river front, where the coal is received by barge or vessel. Cargoes shipped from Maryland, Pennsylvania or New Jersey tidewater ports are received at the yard piers and unloaded directly from the vessels into large

storage pockets, this minimizing handling and transportation cost, and from the pockets the coal may be loaded into vehicles by gravity.

#### Company Operates Three Yards.

The yards of the company may be said to be practically given over to storage facilities, the pockets being large and lofty structures that will hold many thousands of tons. The volume of trade is such that at some seasons of the year the stock on hand will exceed 50,000 tons, and this is divided between different sizes or qualities of anthracite and varying grades of bituminous or steam coal. The yards are at Point street, where both anthracite and bituminous coal are stocked, at Eddy street, where nothing but anthracite is stored, and at Dyer street, where bituminous coal is handled. The locations of the yards have been given in their order from south to north along the river front. These were originally operated by separate companies until a consolidation was effected, and be-

able section of what is known as the East Side can only be reached by sharp climbs unless circuitous routes are driven over. One of the main thoroughfares over the ridge, known as College Hill, rises 14.1 feet to the 100, and one must ascend this a considerable distance to reach the crest, the grade decreasing from Benefit street. The highest point in the city is 210 feet above tidewater.

While a part of the city in which there are many manufacturing establishments can be reached without ascending heavy grades, the greater part of coal deliveries must be hauled up the ascents, which means that distribution is more expensive than might be assumed because of the pay tonnage being hauled in what may be regarded as unfavorable conditions. That is to say, the numerous hills necessitates all loads being hauled up or over them, requiring more time of animals and greater consumption of fuel with motor vehicles. Providence differs from many cities in that practically

all of the main channels for traffic converge in the centre of the city, and to cross from the yards of the company to any of these avenues direct routes are seldom practical.

Distribution of coal in Providence is by a different method than is usually the vogue elsewhere. The dealers establish yard prices, and to these an average of 40 cents a ton for steam coal and \$1.15 for hard coal is added when delivery is made, which is the haulage charge. This obtains within what is known as the delivery limit, and beyond this there is an additional charge that depends upon the distance or, perhaps, the time that would



Truck Loaded with Bituminous Coal Leaving the Pockets of the Dyer Street Yard of the Eastern Coal Company—All Loading Is Done by Gravity.

cause of the volume of business there was no possibility of meeting all of the demands with a reduction of yard facilities.

The company makes contract to supply industrial plants, some of which require daily haulage because of limited storage space for fuel, while others can be served with more or less intermittent delivery. The hauls range from a few short blocks up to practically  $5\frac{1}{2}$  miles for what may be termed regular work, and as far as 10 miles in some conditions. The company delivers coal to families practically within the same radius, though the orders from outside the five-mile radius are comparatively few.

#### City Built on Seven Hills.

Providence, because it is built on seven hills, has been spoken of as the "Modern Rome," and the business section of the city is comparatively low. From the water front haulage in every direction is up long grades that are not as a rule steep, though a consider-

able section of what is known as the East Side can only be reached by sharp climbs unless circuitous routes are driven over. One of the main thoroughfares over the ridge, known as College Hill, rises 14.1 feet to the 100, and one must ascend this a considerable distance to reach the crest, the grade decreasing from Benefit street. The highest point in the city is 210 feet above tidewater.

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With reference to coal deliveries, statement may be made that with rare exceptions no thought has ever been given by architects or builders to economizing the cost of fuel delivery, and there are few buildings that have provision made for quickly discharging loads. This applies to manufactories quite as well as to office buildings and public structures of all kinds, and coal must be carried into a very large number of residences and practically all of the apartment houses. This will explain why a seemingly large crew of help-

ers may be used with a truck, as will be told of later on in the article. The absence of facilities for unloading rapidly is also a reason why coal dealers in Providence have found use for more haulage equipment than might be used in handling an equal tonnage elsewhere.

#### **Distances Based on Straight Lines.**

In fixing the charges for delivery all distances are established by straight lines on the city map, so that the hauls are almost invariably longer than the mileage charged for, the variability depending upon the section where an order is to be delivered and the most practical route that may be taken. This custom is not advantageous for the coal dealer, but it insures the customer against overcharge. Having been the vogue for many years a change to exact mileage might be objectionable and, of course, it is desirable to name the delivery charge in advance. For these reasons the dealers have continued the mileage radius lines rather than make the delivery charge on actual distance driven.

As has been the experience in practically all northern cities of the United States, the heaviest demand for coal is during the autumn and winter months, and during the spring and summer the requirements diminish to the lowest point. All dealers can usually find use for more haulage equipment than they own from September until April, and during the remainder of the year many of them have not enough work to keep their vehicles busy. In winter, when there is the largest demand for fuel and the orders are frequently imperative, additional teams and drivers are hired because the limit of the equipment is reached and the animals can only be worked reasonably, the highway conditions being the governing factor.

#### **Maintenance of Delivery Equipment.**

Some of the dealers maintain the smallest number of horses and carts they can work profitably; preferring to hire teams during a part of the year rather than having a reserve that will be unprofitable a part of the time. But as a rule in the event of any period of unfavorable street conditions delivery is delayed materially. The Eastern Coal Company utilized 140 horses throughout the year, which was about the number that was needed during the winter months. Until several years ago it had an exchange agreement with the Providence Ice Company by which the animals not required for coal delivery in summer were used by the ice company (summer being the busiest with that concern), and in winter the surplus horses of the ice company were placed in the service of the coal com-

pany until needed in the spring.

This plan afforded to both companies an unusual elasticity of delivery equipment with abundant reserve when most needed, while each paid an extremely economical price for service when it was most valuable to them. From the viewpoint of economy the exchange of animals was very profitable as compared with the cost to competing companies for horse maintenance, and it worked out equitably, for each required additional horses about the same length of time during the year. Each company had practically all the horses needed when the demands for haulage were heaviest and was relieved of all expense of keeping the surplus animals until there was again use for them. Of course the investment was not released and there was necessity of maintaining adequate stables, harness, wagons and carts, but there were no costs for drivers, stable men, feed, shoeing, etc., for about half the year. This reduced the actual cost for each animal very much below the figure that would have obtained



**Load of Anthracite Coal Being Taken from the Eddy Street Yard—The Yards Are Generally Used for Storing but One Class of Fuel.**

in ordinary circumstances, and both companies could afford to keep larger equipment than might have been regarded as necessary or desirable.

#### **Variability of Horse Loads.**

Of course with horses there is always necessity of careful supervision with regard to work, lightening the loads in extremely hot weather or in winter when the streets are covered with snow or ice. Assuming that a 100 per cent. load is handled in the spring and autumn, there is sufficient shrinkage during the hot period of summer and because of bad weather in winter so that the average load for the year will be considerably less, provided that the owner is thoughtful of his horses. The Eastern Coal Company worked several three-horse teams and six or seven single horse wagons, so that practically all of the work was done by two-horse teams, except when the animals were "doubled" in the event of snow or badly obstructed streets.

The company's team tonnage is claimed to be more

than is obtained by coal companies even with more favorable street conditions because of the policy of buying large and high grade animals—none of the horses being less than 1600 pounds and as much as 2000, and the initial prices usually are in ratio to the sizes, assuming, of course, the horses are healthy and young. But this tonnage is only obtained through additional expense for the equipment. Comparison of figures of Providence firms, especially the Eastern Coal Company with those of other cities, will not show the difference in the teams, though there will probably be a variance in the cost figures.

#### Trucks Worked with Horse Carts.

Many Providence coal companies have used trucks for several years, but the shrinkage of horses has not in any case been in excess of 50 per cent. Most of the companies have increased their business, but when the hauls are long these are made with trucks and horses are worked where there has been the least development, so that the number of horses used does not



Weighing a Load of Anthracite Coal at the Eddy Street Yard of the Eastern Coal Company, a Double Scale Minimizing Truck Time.

fairly represent the business growth.

Because of policies and various economies the officials of the Eastern Coal Company were not convinced that trucks would be cheaper than animals when a considerable number of competitors began to operate machines. The first truck was bought early in 1913, this being two-ton capacity, and this was used experimentally. It was operated in all kinds of work with the view of determining how it would compare with lighter horse carts. Accurate record was not kept and definite figures of its work are not known. The truck was tried against horses, but because of the comparatively low animal expense the conclusions made when the limit of its serviceability had been reached were not especially favorable.

In the spring of 1915 the rapidly increasing cost of horses and their maintenance, as well as knowledge obtaining from observation of the service of trucks by other firms, were large factors in impelling the company to buy its first large truck, a five-ton Pierce-Ar-

row machine with hydraulic hoist and dumping body. Probably there was no greater influence for the purchase than the assurance of the representative of the Foss-Hughes Company, the Pierce-Arrow agent, that it would be given every practical assistance in obtaining efficient and economical results with the machine. The agent assured the company that a consistent co-operation could be relied upon and all of the resources of the agency were at all times available.

#### First Truck Bought Aug. 16, 1915.

The truck was delivered Aug. 16 and a driver of a horse team was trained by a demonstrating driver from the agency. Profiting by its experience with the smaller machine a very complete record system was installed by the company and carefully kept. The recommendations of the Pierce-Arrow agent's representative with reference to cost accounting were followed and from the time of delivery every detail was entered. The purpose of the company was to know without question precise cost for not only a given period, but for every day of operation. The records were made under the direction of the company's superintendent and were compared daily, so that any material variance could be accounted for.

The company realized that if trucks were to be made profitable they should be kept moving as much of the time as was possible. They could be loaded by gravity at all the yards (which was no advantage over all horse equipment), so that all gain must be made through speed, large daily mileage and careful attention to unloading. With reference to unloading, if the delivery was a single load and the conditions for discharging were known, the driver, helper and a sufficient number of carriers were sent to insure against excessive delay. Three men, for instance, could handle a load quickly, being paid sufficient to induce them to work fast so the truck would be released to return for another load. This was more economical than having fewer men and holding the truck longer. If the conditions were unknown a crew was on the truck that would insure against loss of time. Where deliveries were continuous or in considerable volume special provision was made, such as planning the handling of the truck or providing means for facilitating discharging.

#### Truck Worked on Long Hauls.

The truck was worked on all the long hauls and then on such work as in the judgment of the superintendent it was best suited for. The first results were so satisfactory that a second machine was ordered.

this being delivered Oct. 22. The two trucks were at that time believed to be sufficient to do practically all the hauling outside of the zone in which horses were believed to be the most economical. The longest regular hauls, were to the Imperial Printing and Finishing Company at Bellfonte, the Pocasset Worsted Company at Thornton and the Providence water works pumping station at Pettaconsett, the round trip to the last named delivery point being close to 11 miles. Because of highway repairs this delivery was extended to 14 miles, which would require seven hours for a team of horses, but the truck made six trips daily, or 84 miles a day without overtime work, and eight trips, or 88 miles a day, over the 11-mile route.

The third truck was delivered Jan. 11, the fourth Feb. 17, the fifth March 3, this giving a fleet that was so much in excess of the long haul requirements that some of the trucks were worked on family orders a considerable part of the time. The record system was expanded as the trucks were added and the same care was taken with accounting. Comparison of work and expense was found to be productive of good results so far as obtaining economies was concerned. The winter was exceptionally severe and the unusual snow storms almost continuously obstructed streets and roads for several months, but where the horse carts were used with as low as 20 per cent. capacity loads in some instances the trucks were always freighted to five tons and deliveries were made with surprising regularity and efficiency, although the fuel consumption was in ratio to the highway conditions.

One of the contracts is with the Revere Rubber Works, where the trucks are driven directly into the boiler room and dumped so the coal can be handled direct to the stoking machines. Expert drivers say that this is an exceptionally difficult delivery, for time and extreme care are necessary when driving into or leaving the power house because of the very limited space. Trucks making this delivery haul from 12 to 14 loads a day, and eight loads to 1:30 Saturdays. The mileage for the day is approximately 40, but the tonnage will range from 60 to 70, according to the conditions.

Another delivery that is made in extremely unfavorable conditions is at the Pocasset Worsted Company's mill, where the roadway churns into mud to a considerable depth during wet weather, and the trucks must be driven through this loaded and light to reach and leave the boiler room. Time is often lost at this point where a comparatively small expenditure would work a very large economy, but the company would

seemingly pay more for coal than make a permanent road to its plant.

#### **Fleet Is Now Eight Trucks.**

The company took delivery of its sixth truck Aug. 5, and the seventh and eighth were delivered the present month. All of these are now at work and giving a very good service. With six trucks and 72 horses the company's superintendent said that he was doing work that could not be done with 200 horses, because of the system of handling the machines. In average work he regards a truck equal to five teams of two horses, and this is the result of experience since the first truck was bought. On this basis, without considering elasticity and reserve, and without overtime, the eight trucks are as good as 80 animals.

Concerning the cost of operation of the machine, statement may be made that the company because of its method of operating, places the value of a team of horses with cart and driver exceptionally low, approximately \$4.50 a day, which would make a truck worth in earning power, without overtime, about \$22.50. The



**Crew of Five Men Carrying in Coal That Cannot Be Quickly Discharged to Minimize the Time of the Machine—A Very Frequent Instance.**

cost of operating the first truck bought for a year was something like \$400 less than the estimate of the representative of the Pierce-Arrow company's agent, which was surprising when the work of the truck is considered.

#### **Repair Cost of a Year's Work.**

Within a few days of the expiration of the first year No. 1 truck was withdrawn from service for an overhaul. The machine had been worked several holidays and Sundays and had been used very close to if not 300 days. The mileage in that time was 21,953.8, or an average of 73.18 on a basis of 300 days' work, and the maintenance expense (repairs and overhauling) cost in round figures \$440, so that, taking the estimate of the Pierce-Arrow agent's representative as a standard the saving over the estimate practically paid for all repairs and the overhauling.

The mileage of the trucks will range from 55 to 70 miles a day, which will show that they are worked



with unusual care and with minimum loss of time. The longest day's work of record is 103 miles, which was making contract delivery to Hillsgrove, the round trip being between 15 and 16 miles. All the drivers were taken from the horse carts of the company and trained under the direction of Pierce-Arrow demonstrators, and they are a very efficient crew.

The Eastern Coal Company does practically all its own work maintaining its horse equipment, having wheelwright, blacksmith, harness and paint shops on its plant, which was another factor for horse economy. In operating the trucks it has had practically all the work done at the Pierce-Arrow service station, aside from small jobs, such as a spring replacement. The company garages its trucks in a building in Point street that is to be a combination garage and stable, and which will also be equipped with a shop for making repairs of all kinds. When this project is realized there will be an organization that will efficiently maintain the machines.

The policy of the company is to standardize its trucks so far as possible, which simplifies operating, maintenance, records and every detail, although it is now working a two-ton truck that is equipped with a power hoist and adapted for fast delivery within the radius that is covered with horses. The results obtained with this type will determine whether or not the equipment will be increased.

#### **GARY MOTOR TRUCKS.**

The Gary Motor Truck Company, Gary, Ind., maker of Gary worm drive trucks, is manufacturing four models,  $\frac{3}{4}$ -ton, one-ton,  $1\frac{1}{2}$ -ton and two-ton chassis. The  $\frac{3}{4}$ -ton has a 25 horsepower Buda motor and the one-ton a 30 horsepower motor of the same make. The Buda motor used in the  $1\frac{1}{2}$ -ton chassis develops 30-35 horsepower, and in the two-ton truck a 40-45 horsepower motor is used.

The Gary trucks are guaranteed for one year from date of delivery against any defects in workmanship or material providing they are used according to conditions prescribed in the guarantee.

#### **GAINING RUSSIAN TRADE.**

The American-Russian Chamber of Commerce, 60 Broadway, New York City, has issued a bulletin, "The Russian Market, Its Possibilities and Problems." This bulletin gives a highly interesting and practical outline of the methods to be adopted in cultivating business with Russian firms and consumers. "Representatives of American business can enter the Russian market in two ways. First, by establishing companies in the United States for the purpose of doing business in Russia, and second, by organizing companies in Russia." This statement is made by the bulletin with an exhaustive treatment of the subject.

#### **KISSEL TRUCK A LARGE ECONOMY.**

A. Schaefer of Schaefer Bros., dealers in cement blocks and masons' supplies at Rochester, N. Y., who uses a KisselKar truck, says that trucks are economical where the loading and unloading facilities are good and the roads in fair shape.

"They can be used to advantage in delivering sand, gravel, crushed stone and lime. On hauls of five miles or more trucks are cheaper than teams. For a 20 or 25-mile haul rail shipments are cheaper only providing you do not have to unload and haul again at the receiving end."

"Our hauls average 10 miles the round trip drawing five or six tons a load and we make four trips a day. All our short hauls are done with teams. Our KisselKar truck does the work of  $3\frac{1}{2}$  teams, which would cost us \$5.50 per day or \$19.25. We have a driver and laborer on the truck and figuring depreciation, insurance, gas, oil, etc., it costs us \$12.50 per day, a saving of \$6.75.

#### **SIDE LOADING AMBULANCE.**

A side loading ambulance body, which it is claimed has many advantages in use over the old rear entry type, is now being built commercially by Charles C. Blackmore of Dayton, O. It is especially serviceable for military duty or hospital and police work, being instantly convertible so that four men may ride inside in addition to two patients on the stretchers and a driver.

There are berths for four patients and the upper two can be let down level with the frame of the chassis after the sides of the ambulance have been raised, and the patients put on the berths in a horizontal position. It also has a number of very ingenious convertible features which make it a valuable combination service vehicle for police, fire departments, hospitals and military uses.

#### **TRACTOR DISPLAY AT FAIR.**

One of the International Harvester Company's 16 horsepower tractors which was on exhibition at the Rutland, Vt., fair, attracted more interest than almost any other single exhibit. The machine was one that was being used on the farm of a neighboring estate and when the fair opened the Rutland agent placed it on exhibition, little thinking that it would be the centre of interest.

#### **GOVERNMENT BUYS POWER SPRAYERS.**

The United States Department of Agriculture recently asked for sealed bids to furnish three motor truck power spraying machines for use at Melrose Highlands, in Massachusetts. It is understood that these machines will be placed in service of the Bureau of Entomology.

**SELDEN SALES INCREASE.**

The Selden Truck Sales Company, Rochester, N. Y., from Jan. 1 to Aug. 31 of this year showed an increase in business of 258 per cent. over the corresponding period in 1915 and during September the shipments were 121 per cent. over shipments in September last year.

President George C. Gordon of the Selden Truck Sales Company stated at a meeting of the directors that the big increase shown covered actual shipments and did not include the large export business.

H. T. Boulden, sales director of the company, has plans well under way for an aggressive dealers' campaign in all parts of the United States and Canada.

**NEW FACTORY FOR COTTA CO.**

The Cotta Transmission Company of Rockford, Ill., has purchased a new factory site at 11th street and 23rd avenue in that city and on it will erect a plant of the monitor type. It is expected that the new factory will be ready for occupancy by the last of November, when the present factory at 814-818 South Main street will be offered for sale.

Between 175 and 200 hands will be employed in the new plant, which was made necessary by the largely increased demand for Cotta transmissions. T. D. Reber is president of the company, A. D. Scoville, secretary and treasurer, and Edwin P. Reber, general manager.

**AMERICAN MOTOR TRUCK CO.**

The American Motor Truck Company of Hartford, Conn., with executive offices at 1328 Broadway, New York City, has introduced its 1917 model two-ton truck. The power plant includes a Wisconsin motor of 36 horsepower and embodies a number of ideas originated by A. D. Crossley, chief engineer of the company. The chassis is equipped with the latest Bosch magneto-generator and an engine starter as standard equipment.

**CHANGES IN CHASE FORCES.**

Leon H. Abbott, formerly manager of the service department of the Chase Motor Truck Company, Syracuse, N. Y., has been appointed assistant sales manager. The company also announces the transfer of C. N. Gillette, formerly traveling sales representative in southern territory to the New York branch.

J. I. Moore, who was in the motor truck department of the International Harvester Company for several years, has joined the sales force of the Chase company.

**HENRY SPLITDORF DEAD.**

Henry Splittdorf, whose name is known throughout the civilized world wherever the automobile is used as a pioneer manufacturer of magnetos and ignition systems, died at his home in New York City Oct. 17.

He started making magnetos in 1858. These machines were known at that time as the Werner-von Siemens magneto and were used for experimental purposes in college laboratories. He later invented and manufactured the Splittdorf coil for firing mines and explosives and also the Splittdorf repeating relay for use in connection with telegraph instruments. The Rhumkroff coil for X-ray machines is also one of the Splittdorf products. When the automobile industry began to develop he engaged in the manufacture of both ignition apparatus and spark plugs. He is survived by two sons, Charles F., who is vice president of the Splittdorf Electrical Company of Newark, and John Splittdorf.

**S. A. E. STANDARDS COMMITTEE.**

The Standards Committee of the S. A. E. held its October meeting at the Bureau of Standards in Washington, D. C., at which the work done by the various divisions since the June meeting of the society was taken up. On the previous day meetings were held by the Aeronautical Engine, Engine and Transmission and Miscellaneous and Research Divisions.

**PENNSYLVANIA SECTION S. A. E.**

The Pennsylvania section, S. A. E., will hold its first meeting for the season on Oct. 26 at the Engineers' Club, 1317 Spruce street, Philadelphia. Herbert Chase, chief engineer of the electrical testing laboratories, Automobile Club of America, will present a paper on "The Otto Cycle Versus Constant Pressure Cycle for Automobile Engines." The annual election of officers will be held at this meeting.

**PROVIDENCE AUTO SHOW.**

The Providence automobile show, held annually in the state armory in that city by the Rhode Island Licensed Automobile Dealers' Association, will be opened Nov. 10 and continue to and including Nov. 18. The plan of opening the show on Friday night and continuing it through two Saturdays was adopted last year and proved very successful, as it gave a large number of business men and out-of-town people that otherwise would not be able to attend an opportunity for visiting the exhibition.

Percival S. Clark, who managed the show for the last few years, will direct the coming exhibition.

**MOTOR SPRINKLER ECONOMY.**

Alderman Finnegan, director of the department of engineering of Lawrence, Mass., says that it would be more economical for the city to purchase three automobile sprinkling carts than to continue the present contract with the American Car Sprinkler Company of Worcester, which has just concluded a

season's contract for watering the streets of that city.

The director says that the sprinkling under the contract has cost the city \$1200 a month, and that the three automobile sprinklers would displace the two car sprinklers and six watering carts, making a saving of \$36 a day. He also proposes to have extra bodies for the trucks, which would make them serviceable throughout the year.

**WIERENGO IS SALES MANAGER.**

John L. Wierengo, formerly general sales and advertising manager of the Continental Motors Company, has been appointed general manager of the Detroit Truck Company, manufacturer of the Tonford truck unit, which is used in converting Ford chassis into trucks.

The Detroit Truck Company, because of the rapidly increasing demand for its product, sought Mr. Wierengo, who had a long experience in the automobile industry in various capacities with a number of different companies. During the



John L. Wierengo, Sales Manager Detroit Truck Company.

last two years with the Continental Motors Company he had charge of the sales, which totaled \$10,000,000 a year.

Mr. Wierengo is planning an addition to the Detroit Truck Company's plant at 48-52 Eighth street, is reorganizing the company's distributing force and is also negotiating with distributors in South Africa, Central America, Russia, England and Spain.

**ENGLISH MOTOR COMBINE.**

A combination of manufacturers of motor cars with a capital of \$145,000,000 to engage in low-priced big quantity production in England, is reported from London. The manufacturers who are to enter into the combine when the war is over according to the reports, are several big concerns that formerly built automobiles before they turned their plants into ammunition factories.

## SALVE OLD RAILS WITH TRUCKS.

### Track of Abandoned Railroad in Black Hills Saved by Novel Means.

From Nahant station of the Burlington railroad, extending into the Black Hills of Montana a distance of 35 miles, a logging railroad known as the McLaughlin road was built, and when the lumber in the great forest at its end had been commercially exhausted the track was abandoned. When the prices of steel rails soared the Burlington railroad decided to salve the metal of the unused track and made contract with the Black Hills Transfer Company to deliver it at Nahant.

As the forest reserve law prohibits the use of wood burning locomotives, and the track was considerably in need of repair, any type of locomotive could not be used unless considerable reconstruction expense was incurred, and as parts of the track were overgrown with a dense growth of grass, other means of haulage were sought.

The company bought a 3000-pound White truck



White Truck Equipped with Flanged Wheels for Use on an Abandoned Montana Railroad for Salving the Rails.

that was shipped to the Burlington shops at Havelock, Neb., where it was equipped with a set of flanged steel wheels so that it might be driven on the tracks, after which it was delivered at Nahant. The rails were taken up, beginning at the outer end, and with a flat car used as a trailer for the truck the work was quickly done. The first month the truck was driven 3300 miles, averaging 108 miles a day, hauling loads of 12 tons of rails into Nahant. Two round trips could be made daily, climbing grades as high as seven per cent. on second and third speed, and consuming less than a gallon of gasoline for 10 miles. Without load all the work was done on the highest gear ratio.

### AUTOMOBILE INDUSTRY IN INDIANA.

The automobile industry in Indiana ranks fifth according to the United States census report in 1914. The figures gathered at that time showed that there were 86 automobile, body and parts factories in Indiana, employing an average of 7219 wage earners,

with a total wage expenditure of \$5,027,000. Nearly \$19,000,000 was spent that year by the industry for materials and the products had a value of \$29,390,000.

Four other industries ranked higher in number of men employed and wages paid and in cost of material used, while five ranked higher in value of products.

Ten years previous to this census the average product per man was \$2000 and \$149,000 per factory, while the 1914 census shows the average value of product per man to be \$3500 and \$354,000 per factory.

### SELDEN TRUCK BUSINESS BOOMS.

The sales of the Selden Truck Sales Company of Rochester, N. Y., in the eight months ending Aug. 31, increased 258 per cent., and the shipments for the month of September increased 121 per cent., as compared with the corresponding periods in 1915.

### NEW WILLYS-OVERLAND MODEL.

The Willys-Overland Company is now building a new delivery wagon, the Overland model 75-B, having a panel delivery body, which sells for \$625 f. o. b. Toledo. It has a 31.5 horsepower en bloc motor, electric starting and lighting system and 31 by four-inch tires.

The body has 78 cubic feet of loading space, a considerable gain being made as compared with similar bodies by a special seat arrangement. The driver's seat is only half the width of the body, so that there is floor length on one side of 97 inches from the toeboard to tailboard. Claim is made that as a result of these improvements in design it is an ideal machine for light work, as it has large carrying capacity, can be easily handled in dense traffic and is economical in operation.

### RUSSELL MOTOR COMPANY'S PROFITS.

The Russell Motor Company of Canada at the close of the year, July 31, 1916, had a balance at the credit of the profit and loss account of \$499,354, after setting aside an unnamed amount for the war tax. At the beginning of the year the company had a deficit of \$703,363 on the operations of the previous two years, while at the close of this last year the deficit was only \$204,009.

A used motor truck department has been established by the Packard Motor Car Company of New York at the sales rooms at 239-241 West 56th street, New York City. This is an adjunct to the regular truck department.

**FRANCE WILL NEED POWER FARM TOOLS.**

Jules Meline, minister of agriculture of the French government, in a memorandum addressed to President Poincare of France, published in the Journal Official, states that for cultivation of the devastated sections of the country alone there will be need of 2000 tractors, in addition to the 200 already available, 110,000 plows, 50,000 harrows, 22,000 planters and 15,000 reapers.

In the same communication he also mentions the fact that in rural sections of France the use of farm machinery is still looked upon as a costly luxury.

**VERDUN SUPPLIED BY TRUCKS.**

A graphic description of the use of motor trucks to furnish supplies to the troops at Verdun, France, is given in an article in the Petit Journal of Paris, which in part is as follows:

"To keep Verdun supplied the main roads have to be handled just like a railroad. A continuous train of motor trucks has to travel over a circuit some 140 kilometers in extent, the vehicles succeeding one another sometimes as frequently as every 20 seconds. It is indeed a curious spectacle presented by the regular progress, a little slow, of this caterpillar of motor wagons, picked out at night by the luminous flare of their headlights.

"The route is entirely reserved for automobiles. It is not available for horse drawn vehicles except under the strictest regulations and to a very limited extent. It is, in fact, rigorously closed; a corps of signalers and a very efficient system of illuminated signals regulate the direction and control of speed of the vehicles.

**LAWRENCE MOTOR COMPANY EXPANDS.**

The Lawrence Motor Company, which has sales rooms in Pittsburg, Penn., Erie, Penn., and Wheeling, W. Va., has opened offices in Columbus, O., under the management of Y. B. Jones of Chicago. The company sells Vim delivery cars and Republic trucks.

**FARM TRIAL OF EVERITT TRACTOR.**

The Everitt tractor, manufactured by B. Everitt of Detroit, Mich., was recently given long trial and a number of tests on farms under varying conditions. In an 9½ hour period 11 acres were plowed up in one test. The truck was regarded as very satisfactory:

**TRUCKS VERSUS RAILROADS.****Fleet of 13 Reo Machines Operated in Interurban Service at Richmond, Ind.**

With Richmond, Ind., as a centre the Transportation Service Company is operating a fleet of two-ton Reo trucks to 12 different communities, maintaining a time schedule and affording a service that is constantly increasing, although it has the competition of two railroads and an interurban electric line.

The company is managed by Freed & Jones, and it was established rather more than two years ago, when with one Reo truck a service with New Paris, O., a community of 800 people, 20 miles distant, was inaugurated. The company gave a tailboard delivery at either end of the route and obviates the haulage of their customers to or from their places of business and the freight yards, as well as greatly hastening the time of delivery.



Fleet of 13 Reo Two-Ton Trucks Operated from Richmond, Ind., to 12 Different Points for Freight and Passenger Service.

The company gained patronage and developed competition, but these competitors either discontinued or sold to Freed & Jones. This led to the establishment of similar services with Eaton, O., Hollinsburg, O., Greenville, O., College Corner, Ind., Oxford, Ind., Liberty, Ind., Cambridge, Ind., Linn, Ind., Hagerstown, Ind., Carlos City, Ind., and Union City, Ind. The company has a freight and passenger station at Richmond and besides handling a very large part of the freight, carries numerous passengers. The company now has 13 machines in use, the accompanying illustration showing the fleet, which was driven overland from Lansing, Mich., to Richmond.

**N. A. C. C. ANNUAL BANQUET.**

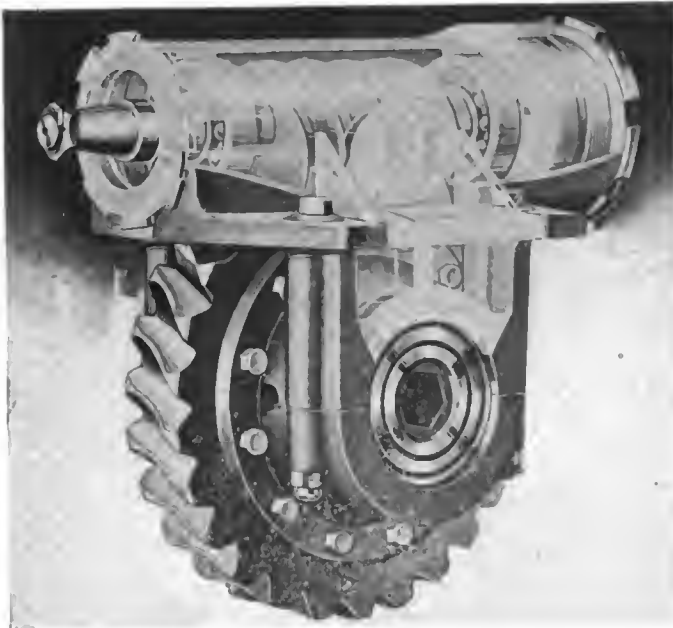
The annual banquet of the National Automobile Chamber of Commerce will be held in the Waldorf-Astoria on Tuesday evening, Jan. 9, 1917, during the week of the National Automobile Show in New York City.

## SHELDON SEMI-FLOATING WORM-DRIVE AXLES.

**Specially Designed for Truck Service, to Obtain Simplicity, Endurance and Extreme Efficiency, and Constructed of Materials of the Highest Quality.**

(Continued from September Issue.)

**T**HE purpose of the thrust bearing is to insure against a wedging action under load, and as the thrust bearing of a Sheldon axle must at times be



The Worm Shaft, Wheel and Differential Gearset Assembly, Identical in the Sheldon W-10, W-20 and W-21 Type Rear Axles.

heavily loaded, the forward end of the worm is carried in a single bearing and the rear end on a single row radial and a single row thrust bearing, the forward end being free to "float" in the bearing in the event that it is expanded from the heat generated by friction from contact with the worm wheel. This expansion may be in some circumstances from .002 to .006 inch, and as the front end may float in the annular bearing, there can be no pressure upon either shaft or bearing in excess of the normal requirements, and the efficiency of the worm shaft is not impaired. This manner of mounting does not allow any change of the relations of the worm and the worm wheel, but it does insure against conditions that may obtain in exceptionally heavy duty and protect the shaft and bearings.

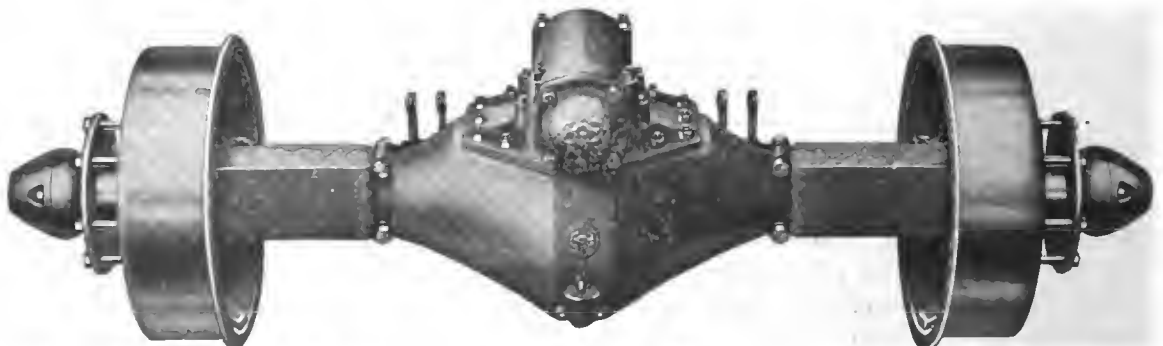
What has been stated with reference to the semi-floating types and the characteristics of Sheldon worm drive axles obtains practically in all types constructed,

though there is slight variance in the design of some of these. The types are six in number, W-1000, having 1000 pounds load capacity; W-1500, 1500 pounds load capacity; W-10, one ton capacity; W-21, two ton capacity; W-30, three ton capacity; W-50, five ton capacity. Of these the original W-20 type has been replaced with the W-21 of the same capacity.

### W-21 Type a Subject for Review.

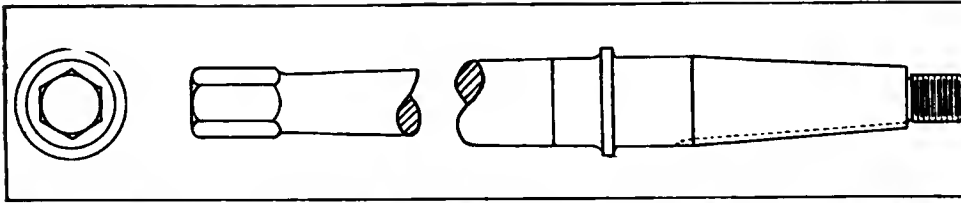
The W-21 axle has been selected for the purpose of description, as it represents the most highly improved construction and is regarded by the engineers of the company as being typical of Sheldon design and quality. The axle housing is a single-piece casting, with the ends slightly flattened, so as to have more width than thickness, affording greater strength of section and liberal spring seats. This is cast so that the central section or bowl may be enclosed by the worm and wheel carrier, to which is bolted the differential gearset. The bowl of the axle serves as an oil reservoir as well.

The worm and wheel carrier is a heavy casting with a wide flange that fits the opening in the bowl of the axle housing, and on the top of this is the housing in which the worm shaft is mounted. The tunnel for the shaft is closed at the rear by a cap and at the front by a stuffing box, both of which are secured by heavy cap screws. The ends of the tunnel section of the carrier are enlarged to afford strength at the bearing seats, and there are reinforcing studs at either side of the bearing seats. The machining of the carriers is done in fixtures that insure extreme precision so as to obtain perfect alignment. The differential bearing supports, at either side of the differential case, are mounted on through bolts, two for each support at either side of the bearing, that are secured with locked nuts. The seats for the bearings are machined with extreme care, for there are no adjustments, the only practical variance being obtainable with shims. The bearings are a double-row type of large capacity that take both the radial and thrust loads.



The Complete W-21 Sheldon Worm Drive Rear Axle, Load Capacity Two Tons, Equipped with Double Internal Intensifying Brakes.





Drawing Showing the Detail of the Driving Shaft of the Sheldon W-21 Worm Shaft and Wheel Axle.

The differential cage or case contains the conventional four-pinion gearset, the gears and pinions being bevel type, and this is bolted to the special bronze worm wheel by a series of 12 nickel steel bolts. The hubs of the differential gears, which have hexagonal bores, extend through the supports to the outside of the bearings. The construction has been extremely simplified, for there are no adjustments possible and the assembly should require no attention after it has been inspected and passed at the factory.

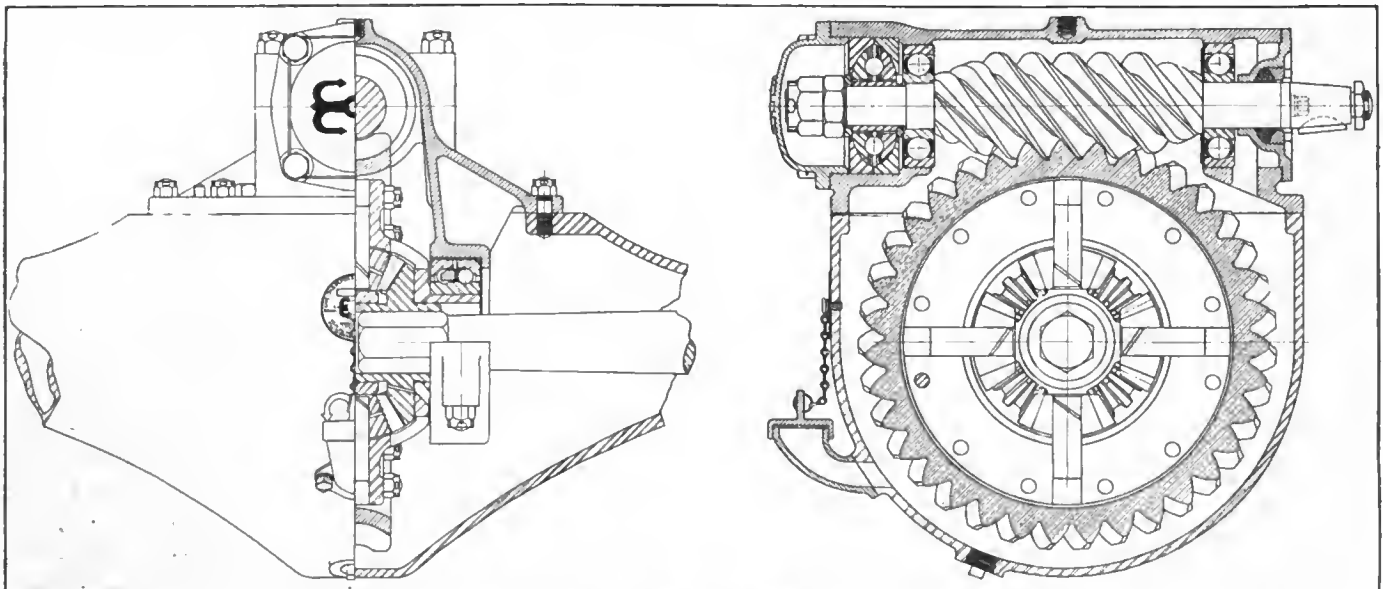
The worm shaft is constructed with much care and when the bearings have been seated and secured there is no possibility of it requiring adjustment. As may be seen from inspection of the drawings, the rear ball and thrust bearings are seated and the bearings are secured on the shaft by the locked nuts on the rear end, and the bearings are retained in their seats by seating the rear bearing cap, which is secured by four heavy cap screws that are locked. At the forward end the shaft may float in the ball bearing, and ahead of this is a large stuffing box that is secured by four locked cap screws. There is a baffle plate between the shaft and the bearing that prevents an excess of oil reaching the bearing. The carrier is secured to the axle housing by a series of 14 studs, four of which reinforce the shaft housing at either side of the bearings, and the other 10 are at the edges of the carrier plate.

By the removal of the nuts from the 14 studs the entire carrier assembly may be lifted out of the axle housing and placed wherever convenient for work, and the only requirement is that there be sufficient clear-

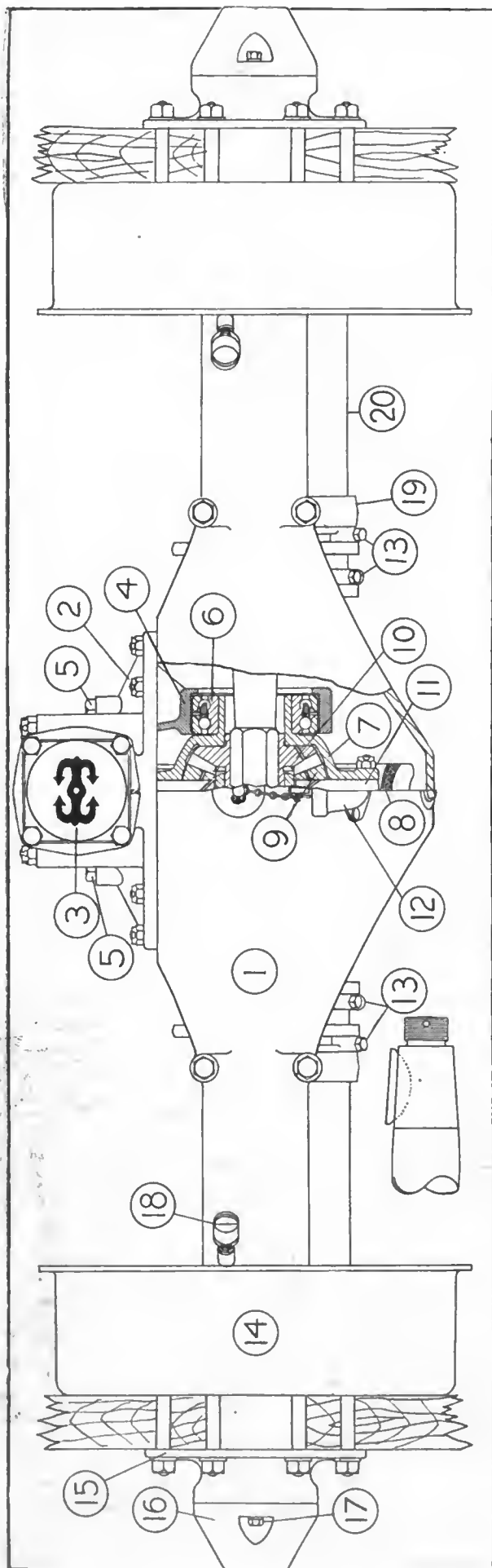
ance above the axle housing for the unit to be handled. The unit can be hoisted clear of the axle in the event of the body being removed from the chassis.

Very near the outer ends of the axle housing casting are flanges, and the ends of the bores of the casting are recessed for the seats for the felt packing rings. The machine work at the flanges and seats is simple, but must be extremely accurate. The brake band support, or really brake spider, is bolted to the flange by four bolts. This brake band support really carries the outer axle bearing, which is practically the full size of the axle casting at this point. By referring to the sectional drawings of the W-21 axle one may ascertain that the axle shaft increases in size to a point just outside of the oil packing rings, where there is a collar. Between the collar and the packing rings is an oil ring retainer, which prevents the flow of lubricant outward. Outside of the collar the shaft is straight and from the outside of the bearing to the end of the wheel hub bearing it tapers.

The outer or wheel bearing is retained in its seat by a plate that is secured to the brake band support by four heavy cap screws. When this plate is seated the collar of the axle shaft is in contact with the bearing and when the wheel hub is keyed and locked on the shaft the inside of the hub is against the outside of the bearing, so that there is no play or motion, but the wheel is free to turn. The wheel hub is built with a wide inner flange and the hub plate has a flange of similar width. A shoulder is machined on the hub flange on which the inner periphery of the pressed steel brake drum is seated before the wheel is assembled. The wheel hub bolts extend through the hub and hub plate flanges, the brake drum and the spokes. The hub cap is secured to the hub plate by cap screws.



Drawings Showing the Transverse Section Details and the Longitudinal Details of Construction of the Worm Shaft and Wheel Carrier of the W-21 Sheldon Axle.



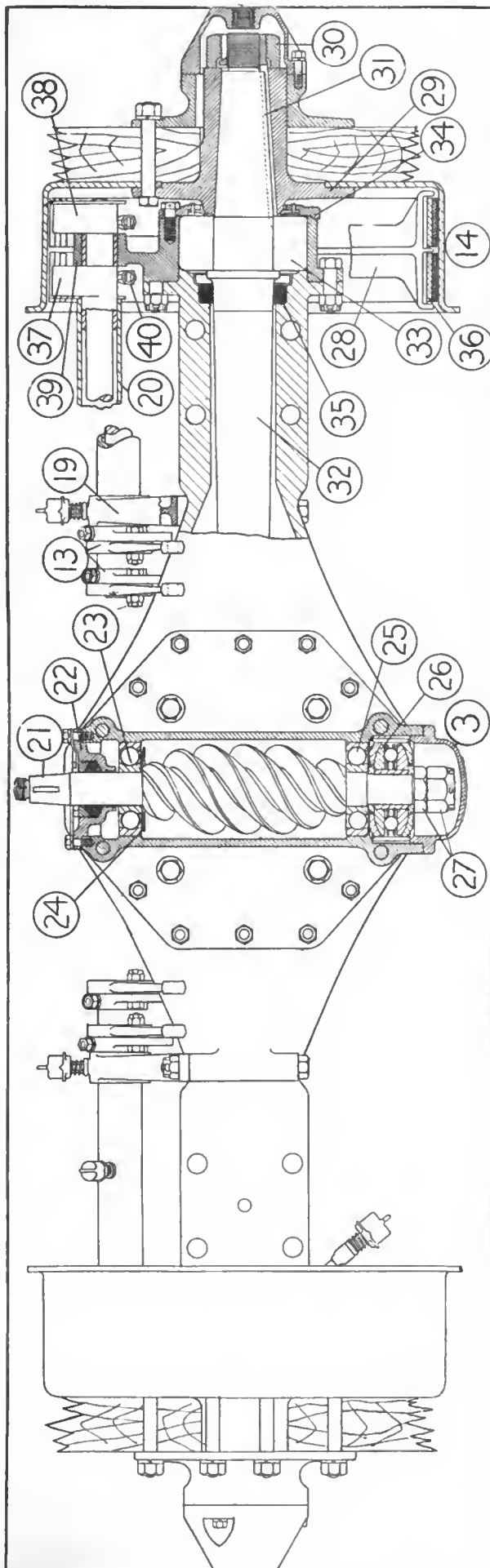
PART VERTICAL SECTION OF THE W-21 SHELDON WORM SHAFT AND WHEEL REAR TRUCK AXLE, SHOWING THE COMPONENTS OF THE SINGLE-PIECE CAST STEEL HOUSING AND THE ELEMENTS OF THE DIFFERENTIAL GEARSET ASSEMBLY.

- |  |                         |                           |
|--|-------------------------|---------------------------|
| 1—Axle Housing.                              | 11—Differential Spider. | 16—Hub Cap.               |
| 2—Worm and Wheel Carrier.                    | 12—Oil Filler.          | 17—Hub Cap Bolt Lock Nut. |
| 3—Rear End Cap.                              | 13—Brake Levers.        | 18—Bearing Grease Cup.    |
| 4—Differential Bearing Support.              | 14—Brake Drum.          | 19—Brake Support Bracket. |
| 5—Differential Bearing Support Through Bolt. | 15—Hub Flange.          | 20—Brake Sleeve.          |
| 6—Differential Bearing.                      |                         |                           |
| 7—Differential Gearset Case.                 |                         |                           |
| 8—Worm Wheel.                                |                         |                           |
| 9—Differential Pinion.                       |                         |                           |
| 10—Differential Gear.                        |                         |                           |

The manner of securing the wheel is by a key that extends the full length of the axle spindle, and by a double nut. The inner nut is made with a collar that will seat against the key end. The nut is split and can be easily turned on. The outside of the nut is threaded to the collar. On this split nut is screwed a nut that is recessed inside to pass over the collar and seat the edge against the wheel hub. When the outside nut is tightened it is securely locked.

The brake band support is a heavy steel casting that carries the outer bearing of the axle shaft, the brake shafts and brake shoes, which are an internal expanding type, as well as the bearing retainer. The brake band support is practically a hub from which four spokes or arms radiate at intervals of about 90 degrees. These spokes are widened transversely at the ends, and on the ends, running circumferentially, are three equidistant ribs or webs that form channels that retain and guide the brake bands, which are two in number. These bands or shoes are single sections, the two ends carrying the lugs or ears, and these may be expanded by rocking the brake shafts, which carry cams. The brake bands are heavy spring steel faced with high quality brake lining. These bands are kept in contact with the guides or channels in the supporting arms until braking is necessary, when either or both may be expanded against the inner periphery of the brake drum. This is a special design that is known as an intensifying type, and claim is made that it is exceptionally efficient.

Well inside the spring seats and secured to the axle housing by two through bolts each are the brake support brackets, which carry the lever ends of the brake shafts. These brackets are heavy and are designed to endure extreme braking stresses. The other ends of the shafts are mounted in bushings in the brake band support. The brake shafts are the shaft and sleeve construction, the sleeve carrying the shaft on substantial bushings. The shaft extends beyond the sleeve ends and the cam actuates the brake band nearest the wheel. Both cams seat against the web of the brake band support. The outer sides of the cams carry lips that extend above the brake bands to prevent the bands lifting or riding the guides and to insure against



TOP SECTIONAL VIEW OF THE W-21 SHELDON WORM SHAFT AND WHEEL REAR TRUCK AXLE, SHOWING THE WORM SHAFT AND AXLE SHAFT AND THEIR BEARINGS AND THE CONSTRUCTION OF THE DOUBLE INTERNAL EXPANDING INTENSIFYING BRAKES.

- |                              |   |                             |
|------------------------------|---|-----------------------------|
| 13—Brake Levers.             | 23—Worm Shaft Front Bearing.            | 35—Felt Oil Packing Rings.  |
| 14—Brake Drum.               | 24—Oil Baffle Plate.                    | 36—Brake Bands and Linings. |
| 18—Brake Support Bracket.    | 25—Worm Shaft Rear Bearing.             | 37—Brake Cam on Sleeve.     |
| 20—Brake Sleeve.             | 26—Worm Shaft Thrust Bearing.           | 38—Brake Cam on Shaft.      |
| 21—Worm Shaft.               | 27—Lock Nut.                            | 39—Brake Spider Bushing.    |
| 22—Stuffing Box and Packing. | 28—Brake Spider and Brake Band Support. | 40—Brake Band Springs.      |
|                              | 29—Wheel Hub.                           |                             |
|                              | 30—Axle Lock Nuts.                      |                             |
|                              | 31—Axle Shaft Key.                      |                             |
|                              | 32—Axle Shaft.                          |                             |
|                              | 33—Annular Wheel Bearing.               |                             |
|                              | 34—Wheel Bearing Retainer.              |                             |

failure to expand or contract. One of these lips is brazed to the cam and sleeve, and the other is secured to the shaft cam by a pinned pin and brazing.

The lever ends of the sleeve and shaft are extended beyond the brake support bracket, and near these ends are screw retained hubs, each of which carries a fan section or partial flange. Outside of these hubs are placed the levers, the bores of which take the shaft and sleeve. In each flange are three holes, 30 degrees apart on centres, and in each lever is a single hole. The levers are bolted to the flanges, and by changing the position of the bolt with reference to the holes in the flanges an adjustment of 30 degrees may be made at a time and a total adjustment of 60 degrees to compensate for wear of the brake band facing. The shaft fits the sleeve bushings closely and the space between the shaft and sleeve, inside the bushings, may be wholly or partly filled with lubricant, so that the shafts and bearings may be well lubricated by an oiler. The brake support is lubricated by a grease cup.

The lubrication of the axle is very carefully worked out. The bowl of the housing in which the worm wheel is enclosed is filled to approximately the height of the lowest point of the differential bearing races, so that the worm wheel, differential gearset and the bearings are partly submerged in oil, and there is sufficient distribution to the worm shaft and its bearings. The oil filler is bolted to the axle housing so that should it be broken off by accident it may be replaced by removing a single bolt. The lubricant is retained at the axle housing ends by the felt packing rings, which are secured by metal rings that carry wide leather rings against which the axle collars seat. In this axle the metal rings are pinned into the housing. The wheel or outer axle bearing is lubricated by oil that is carried past the oil packing rings in small volume, and by a direct lead from an oil cup. Every care is taken to insure thorough lubrication, an illustration of this being the attachment of the axle oil filler cap to the housing by a chain, so that it cannot be lost or mislaid, and that it will not fall into dirt and carry foreign matter into the axle. The oil in the housing may be taken out by removing a drain plug, and flushing the entire interior of the axle with kerosene or gasoline to cleanse it is a work of comparative ease.

The equipment of the company's shops is equal to that of any plant in America and there are fixtures for insuring accuracy and interchangeability of parts. The greatest

care is taken to obtain precision and highest quality. The company does all its own drop forging, has an iron foundry of considerable proportions, and a heat treating department that has every facility for tempering steel. The switchboard type of pyrometer is used to maintain temperatures. This department does all the work for the spring shop as well. The shops are equipped and organized with the purpose of obtaining the greatest possible economies.

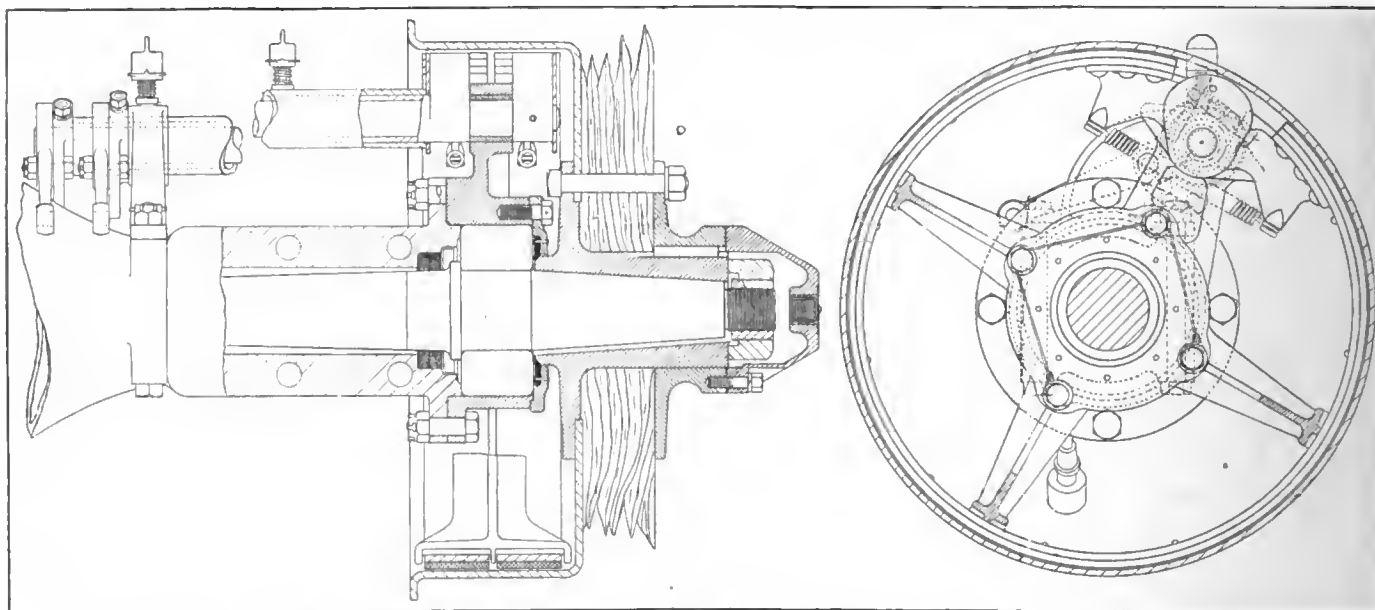
#### The Other Types of Axles.

The other sizes of axles differ slightly from what has been described. The W-1000 types has a pressed steel housing, the W-1500, W-30 and W-50 have housings in three sections that are riveted together, and W-10 and W-21 are single-piece castings. All the others have double internal expanding brakes operating in the brake drums, the W-21 being the only axle thus far equipped with the double internal intensifying brake that operates in one direction. The W-21

from 94 to 97 per cent. efficient. Standardization of the axles further may be expected to obtain greater production economies. The principles of semi-floating construction and annular bearings for the worm shaft are regarded as being finally determined.

#### Extremely High Quality Is Sought.

The company has not endeavored to build cheap axles, but to the contrary has sought to produce what has exceptional quality, and which will have recognized superiority. The prices are more than the prices of other axles, but the company maintains that price is not the measure on which to base judgment, but on what is obtained for the price, and that when judged by service value the axles are exceedingly cheap. Incidentally, the axles are constructed for the Hotchkiss system of driving, in which the torque and braking stresses are taken and absorbed by the springs, and radius rods and torque arms are dispensed with. The Hotchkiss drive is very general in Europe and is being



Sectional Views of the Details of Construction of the Double Internal Intensifying Brake of the W-21 Sheldon Axle.

is also the only type that has the double lock nut for retaining the wheels, and that is equipped with the adjustable brake levers. In the original construction types W-10, W-20, W-30 and W-50 were equipped with internal expanding brakes, with toggle linkage. Types W-30 and W-50 are still built with this form of brakes, but the others are fitted with cam-actuated shoes. On the other axles the axle locking nut is still the standard type. There is some difference in the mounting of the worm shafts of the lighter axles, the rear shaft bearings of the W-1000, W-1500 and W-10 axles being double row New Departure, but there are two bearings, separate radial and thrust, for the rear of the shafts of the W-21, W-30 and W-50 types.

The expectation of the engineers of the company is eventually to adopt construction that shall be standard in practically every detail, and the W-21 axle is the highest development. Statement is made that there is but little more to hope for, as these are rated

rapidly adopted by American power vehicle manufacturers.

The company is the largest single industry of Wilkesbarre, employing upwards of 2000 men and distributing more than \$100,000 monthly in wages, so its responsibility and its place in the vehicle industry may be realized. It is now producing 600 sets of animal vehicle axles daily, a very large number of springs, and in excess of 50 sets of motor truck axles. Rather strangely, the company is building practically all the automobile axles for truck manufacturers, and produces for but one pleasure car maker, and for this one a front axle. The specialization of the works has been away from passenger cars and toward trucks, and seemingly this has been recognized, for the company now builds all of the worm drive axles used by 55 different truck manufacturers, and some of the axles used by 33 other truck manufacturers. Of this total 81 are American builders, four Canadian and three English.

### UNITED MOTORS BUYS BROWN-LIPE-CHAPIN PLANT.

The United Motors Corporation has purchased the Brown-Lipe-Chapin Company of Syracuse, N. Y., manufacturer of differential gears. It is understood that the policy of the company will be continued as at present and that H. W. Chapin will continue as general manager of the plant, but the new interests in the company will immediately make plans for erecting additional buildings to enable the company to increase its production 100 per cent.

President Alfred P. Sloane of the United Motors Corporation will become a member of the directorate and the company's affairs will be conducted with the same idea as is followed in operating the six other subsidiaries of the United Motors, the Hyatt Roller Bearing Company, the Perlman Rim Corporation, the Remy Electric Company, the Dayton Engineering Laboratories, the New Departure Manufacturing Company and the Lovell-McConnell Manufacturing Company.

The Brown-Lipe-Chapin Company was largely owned by Messrs. Brown and Lipe and C. W. Mott and associates of his who are identified with the General Motors Company. The Brown-Lipe-Gear Company of Syracuse is not involved in the transaction.

### TRUCK TUNNEL IN POLITICS.

The propaganda for the Hudson river traffic tunnel, which is proposed for the use of motor trucks going to and from the Jersey side to New York City, has been made an issue in the political campaign in New Jersey by the Motor Truck Club of New Jersey. The club is asking the candidates what their position is on the project and will be guided by the attitudes of the candidates in giving its endorsement to their candidacies.

Six months ago the project was first launched, and since that time the club has been actively engaged in promoting it. A stable bill was passed empowering the counties to expend certain sums of money in investigating the plan and Bergen and Hudson counties have appointed committee to engage in research work with a fund of \$10,000 to defray expenses.

### EXPORT RECORDS BROKEN.

The August export figures of the United States passed the half billion dollar mark, exceeding the high record established last May by \$35,000,000. The imports for August totaled \$199,247,391, a decline of \$47,000,000 as compared with the June figures.

This enormous foreign trade, which is shown in a trade balance in our favor of \$2,465,000,000 for the 12 months to Aug. 31, is also reflected in a record inward gold movement, totaling \$29,000,000 for August and \$410,000,000 for the year.

### NEW DIXON PLANT.

The plant of the Pacific Borax Company on Westside avenue, Jersey City, N.

J., has been sold to the Joseph Dixon Crucible Company and will be used to expand the manufacturing facilities of that concern. The buildings will be altered and a number of kilns built to meet the demand for crucibles in the United States, as well as the company's export business, which is constantly growing. The Borax company's plant, which has been vacant for several years, contains about 18 acres with buildings and is on the line of the Central Railroad of New Jersey.

### TRUCKS COMPETE WITH TRAINS.

A motor truck line operated between Tampa and Plant City, Fla., competes with the freight train service between those two points. The same rate for haulage is charged by the truck operators as by the railroad, but the shippers save both the costs of haulage to the freight depots for shipment and the delivery charges. This freight competition was made possible by the construction of a brick paved road for 22 miles between Tampa and Plant City.

### ROAD BUILDERS' CONVENTION.

The 14th annual convention of the American Road Builders' Association, the Seventh American Good Roads Congress, under the auspices of the American Road Builders' Association, and the Eighth National Good Roads Show of machinery and materials, will be held during the week of Feb. 5-9, 1917, in Mechanics' Hall, Boston, Mass.

### AUTOCAR BOND ISSUE.

The Autocar Company of Ardmore, Penn., has issued \$1,250,000 first mortgage five per cent. serial bonds, dated Oct. 1, which mature from April 1, 1917, to Oct. 1, 1921. The bonds will be issued in installments of \$125,000 each.

The bonds are secured by a first closed mortgage on all of the company's property, which was recently appraised at an amount in excess of \$1,400,000. The profits of the Autocar company for the last two years and eight months have averaged \$500,000 per annum. The capital stock of the company is \$2,000,000.

### MOTORIZE FIRE DEPARTMENT?

Director of Public Safety Swingley of St. Louis, Mo., has recommended the complete motorization of the fire department of that city. He has also submitted figures estimating the cost of motorizing the department at \$400,000, and showing a saving to the city of \$108,000 in salaries, which amount is now being paid to over 100 engineers and firemen who would not be required in the service if motor driven and operated apparatus was in service.

His estimates also include an item of \$100,000, which covers approximately the amount that the old equipment would bring. There are seven motor engines and five motor trucks at present in the St. Louis department and five additional

engines and three trucks have been ordered.

### TRUCK DELIVERS TRUCK.

Gaston, Williams and Wigmore, Ltd., of London, English selling agents of the Selden truck, recently resorted to an unusual but efficient method of delivering two of these machines to a customer more than 250 miles from London.

Two Selden trucks, one  $3\frac{1}{2}$  ton and the other  $1\frac{1}{2}$  ton, were to be delivered at Darlington, England. With the prevailing price of gasoline in England the cost of running both the machines over the road would be considerable, so the selling firm conceived the idea of making the larger truck carry the smaller one. The  $1\frac{1}{2}$  ton machine was loaded on the larger and delivery of both was made for the consumption of about half the petrol that otherwise would have been consumed.

### CEMENT PHOTOGRAPH CONTEST.

The Portland Cement Association, 111 West Washington street, Chicago, is conducting a photographic competition which anyone may enter. A first prize of \$25, a second prize of \$10 and three prizes of \$5 each are offered for the best photographs of concrete objects. The competition is to obtain photographs of all kinds of concrete construction, in road work, buildings, swimming pools, fences, posts or any of the innumerable uses made of it.

### ORDER PACKARDS BY 'PHONE.

Hartley Howard, Jr., truck sales manager of the Packard Motor Company of Pittsburg, received orders for trucks over the telephone from three different concerns in one day. This seemingly unusual buying of trucks, Mr. Howard says, is not uncommon with his organization, as the orders were placed on the strength of what had been done by the Packards already used by those firms.

The orders received came from W. & H. Walker Company, National Tube Company and from the Arbuthnot-Stephenson Company, all Pittsburg concerns. When the orders are filled the first named buyer will have a fleet of five Packards and the two last named will have fleets of six each.

### CAR SHORTAGE SERIOUS.

The shortage of cars on American railroads is beginning to be a very serious problem for automobile manufacturers, who find it extremely difficult to obtain enough cars to make their normal shipments, although they are using almost every conceivable type of railroad carrier from cattle to flat cars, to get their products to the distributors and consumers.

Some manufacturers are leasing every car that is suitable for making automobile shipments, while others fear they will be obliged to cut down production to meet the crisis.



## CONTRACT PRODUCE HAULAGE.

### New Jersey Truck Owner Developed Profitable Business with Farmers.

Haulage produce by contract with farmers may appear to be an unusual and somewhat uncertain work, but Joseph B. Owen of Clarksburg, N. J., who was a Pennsylvania railroad conductor for years, and who is transporting a considerable part of the farm produce grown in that vicinity to Philadelphia markets, has proven that it may be made exceedingly profitable. In April, 1915, he resigned and bought a 3000 and a 6000-pound White truck and started to develop a business that has not been projected. He offered to do the work for prices that were regarded as reasonable and readily found work.

He would not make rounds of farms collecting loads, but would take freight from specified points, although he would call for a capacity load. He begun the service about April 20 and at regular times made his collections. One trip was begun when he left his



Machine Used by J. B. Owen, Clarksburg, N. Y., Who Contracts to Haul the Produce of Farmers to the Markets at Philadelphia.

farm at 4:30 in the afternoon, took on freight at the designated points and crossing the Gloucester ferry reached Philadelphia about 8 o'clock. During the spring and summer months the trucks are started as early as 2 o'clock in the morning and make two trips each, the trip of nine miles from Clarksburg to Philadelphia, including loading, ferriage and unloading, taking about four hours. In the afternoon a third trip is made, beginning about 4:30. Considerable of the freight is delivered at the Owen farm, where it is placed in condition to be loaded and carried without damage.

The trucks haul all kinds of crops, both vegetables and fruits, and while the average load will be from 1000 to 1200 baskets of tomatoes, as high as 1400 baskets have been carried at one time. The charge for these is six cents a basket. The trucks are operated seven days a week during the season the crops are marketed. During the remainder of the year they are used for jobbing, such as furniture transfer, and the smaller machine was rented to the Bell Telephone

Company for six months during the autumn and winter of 1915-16. The trucks have earned more than \$60 a day during the crop period, and have not only paid for themselves, but are showing a very satisfactory profit.

## CONCRETE ROADS IN NEW ZEALAND.

The authorities of New Zealand will adopt concrete as a standard road building material, after carefully studying the subject of good roads.

The highway officials there estimate that a mile of 12-foot road can be built of concrete for \$2000 more than a mile of ordinary stone road, and that there would be a saving in upkeep of at least \$1200 a mile in the first five years, while at the end of 10 years there would be a saving of \$7000 or \$8000.

## SINCERITY IN ADVERTISING.

Alvan Macauley, president of the Packard Motor Car Company, in a plea for sincerity in advertising, declares that it would be well for the quality and the permanence of work nowadays if something of the ancient guild method of judging products could be established and recognized.

"Truth is the splendid slogan of the Associated Advertising Clubs of the World," continues Mr. Macauley. "It must be well known to that organization that there is in the public prints much overpraising of under done work. The evil effects of this tendency are apparent. A false value is attached to minor achievements. The common place is awarded the praise that should go only to genuine work and to products of high quality. Real art is outraged and good taste dulled. The public loses confidence in published words which are not backed by worthy goods. Responsibility for this condition must be shared by the advertising writers who produce this copy, the manufacturers who indorse it and the publishers who spread it broadcast. The whole masquerade calls for action on the part of the Associated Advertising Clubs of the World. That organization might well empower a committee to sit as a tribunal before which extravagant claims might be put to the test."

For the eight months ending Aug. 31 the Allis-Chalmers Manufacturing Company, Milwaukee, Wis., had net earnings of \$1,997,070, as compared with total net earnings of \$1,078,352 for the whole of 1915. At the end of the period the company had \$12,000,000 unfilled orders on hand.

## SMITH SINGLE-PIECE CAST TRUCK WHEELS.

**Extremely Light and Having Great Endurance in Every Practical Test, They Are Produced Commercially by a Company Preparing to Operate on a Large Scale.**

**W**HEEL construction is given but little attention or thought by buyers of automobiles because of the very general belief obtaining that there is really nothing that can be stated of wheels that is not universally known. Discs, and later wheels, turning on

was an unknown quantity. And this statement is true of today. Wire wheels, so-called, are regarded as serviceable for pleasure cars, but they are rarely if ever considered for trucks.

### Why Europe Turned to Metal.

The lack of woods from which enduring wheels could be built caused European vehicle builders to consider metal construction, and both cost and endurance were factors that impelled experiment with solid types, those having hollow spokes, hollow spokes and rims, hollow hub, spokes and rims, and cast in single pieces or stamped in sections and assembled by welding or riveting. The cast wheels were found to be heavy and both design and metal were inadequate, for fracture of the spokes at the rims was a general fault. The assembled wheels were defective in that the rivets loosened or sheared in heavy service.

Constant experiment, however, developed some very satisfactory designs and the metal was greatly improved, but the defects of assembled wheels were seemingly not obviated. Such wheels cost more than wood types, but were regarded as being the more enduring for truck service. In brief, the practical results obtainable with cast metal wheels—and steel is usually the material—may be said to be lighter weight, greater strength, freedom from expansion or contraction from moisture or drying, rigidity when subjected



**Smith Front Wheel, the Lightest Type Weighing Approximately 80 Pounds Without Tire.**

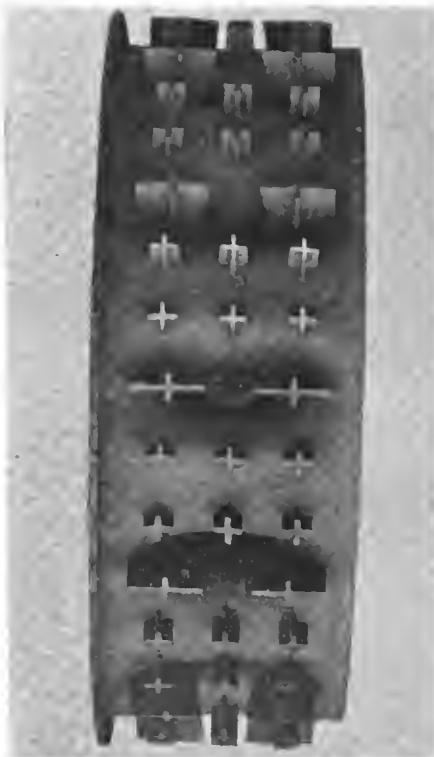
axes, have been used for many centuries, and the types that are used today are the perfected results of careful study and observation, experiment and service for thousands of years. Few there are who realize that the wagon or carriage so familiar to all is a machine that represents the development of our entire period of civilization. The road vehicle, with the boat, is the best known and most commonly used utility.

Until automobile vehicles could be practically used wagon and carriage wheels were sufficient for all service requirements, but these were found to be lacking from the one viewpoint or another. Greater speed and heavier loads necessitated different construction, which was met in pleasure cars by adapting wagon wheels to them, and when freight carrying vehicles were built these required still different types, which were developed from those used for passenger service.

In wheel construction two qualities are especially desirable—strength that will insure safety and endurance, and as light weight as is possible without sacrifice of strength. The use of the bicycle developed a wheel type that had much to commend it, but the wood wheel was preferred by practically all because their experience had been with wooden wheels, and the other



**Smith Rear Wheel Complete with Tire, Which Weighs About 10 Per Cent. Less Than Wooden Construction.**



Smith Rear Wheel with Outer Wall of Rim Cut Away to Show the Series of Internal Supports Between the Walls.

to great stresses, better conduction and radiation of heat that may be created by the friction of tires and lessened wear of tires.

Without further consideration of these claims for metal wheels, which are maintained by European manufacturers to be well established by experience and careful observation extending over a period of years sufficient to justify the

statements, emphasis should be made that the construction of cast wheels has been without exception on sound engineering and the application of scientific principles. Two extremely important factors were determined and their relative values established, one of these being proportions or form of the wheels and the other the character of the metal, for endurance can only be obtained by minimizing the vibratory stresses upon the spokes and using metal that will not crystallize, or at least crystallize very slowly.

#### American Makes of Metal Wheels.

Metal wheels have been made in America and some of the manufacturers of trucks have designed and finished castings made specially to meet their requirements. These wheels have been found so satisfactory that the use has been continued. Several concerns have sought to make metal wheels commercially, but because of the limited demand, the large expense prior to commercial production, and the fact that the quality of these wheels are or have been unknown to truck buyers, the cost has been more than wood wheels, and manufacturers have been loath to adopt them as standard or regular equipment.

Early in May of this year a company that has the corporate name of Smith Wheel, Inc., was organized at Syracuse, N. Y., to manufacture metal truck wheels, and this concern is now producing a series of sizes that are suited for use of all machines of 3000 pounds load capacity or more. The company maintains that its wheels, which are now used on a considerable number of trucks, have every quality that is claimed for metal wheels by European manufacturers, that the

wheels are lighter than wood, are decidedly cheaper, and they are guaranteed for the life of the trucks on which they are used. These products are known as Smith wheels.

#### Invented by Burns L. Smith.

Smith Wheel, Inc., is directed by Burns L. Smith, the inventor of the wheel, and has large capital and exceptional facilities and equipment for manufacturing. The policy of the company is different than that of practically all other manufacturers in that it was established to do business in a large way, with ample resources to build and equip its plant and aggressively enter the industry.

Mr. Smith is a member of the Smith family that has been for years identified with some of the largest businesses in Central New York, these including the Smith Premier Typewriter Company, the Ilion Arms Company, L. C. Smith & Bro., and the Smith Gun Company, which are known as extremely progressive and successful enterprises. Mr. Smith was for a long period connected with L. C. Smith & Bro., and early in 1915 he assumed control of the concern that has since then been organized as Smith Wheel, Inc.

He has had practical training as a manufacturer and has a thorough knowledge of mechanics. Shortly after he made the change he became ill, and during his illness he conceived making a single-piece metal wheel that could be, to his mind, practically produced. He made sketches and devised production methods that he believed might be utilized; and when he had recovered he determined to learn by experiment to what extent his idea was practical.

Preparation of the drawings required considerable time, for these were revised until all engineering requirements had been seemingly met. Then patterns were made and molds constructed and casting begun. Progress was apparently slow because the casting was of itself a work that necessitated many trials before



Smith Rear Wheel with Outer Rim and Hub Walls Cut Away to Show the Supports and Webs That Strengthen the Metal Casting.

anything like the desired results were obtainable.

At this point a statement relative to the metal of which the wheels are cast is desirable. It is not steel nor cast iron, but is an alloy that is made to a formula that the company possesses exclusively, which is unknown to others, and is regarded as an extremely valuable industrial asset. The metal weighs about the same as cast steel or iron and the composition is such that when exposed to strong oxidizing influences it will show very slight oxidization in a long period of time. Construction of this alloy has been exposed in the open air and where it is reached by acid-impregnated gases in large volume for more than 25 years—where steel or iron is very rapidly oxidized and destroyed—with but very slight oxidization. In fact, the metal shows only a very thin coat of rust, such as might be expected on iron or steel after a brief exposure, beneath which the structure is absolutely unimpaired, although not protected by paint. That it is not affected to any extent by moisture or atmosphere was one of the qualities that impelled Mr. Smith to consider its use for wheel construction.

The metal is maintained to be as strong as steel, being tough and elastic, and while it cannot be tempered to have spring resiliency, it has such structure that it does not crystallize when subjected to vibratory stresses, so that it will break as will steel, from fatigue, when exposed to vibration for a greater or lesser period. Another quality is that it is comparatively cheap as compared with steel and it can be worked easily and to closest dimensions with machine tools.

While he was developing the practical construction of cast wheels Mr. Smith studied innumerable patent claims and drawings and the designs of foreign built types. He learned so far as possible the results obtained with these in actual service. Next he judged these by the precise cost and the advantages of the one against other types. This is the measure of the business man and Mr. Smith expected that whatever wheels he produced would have to meet this measure.

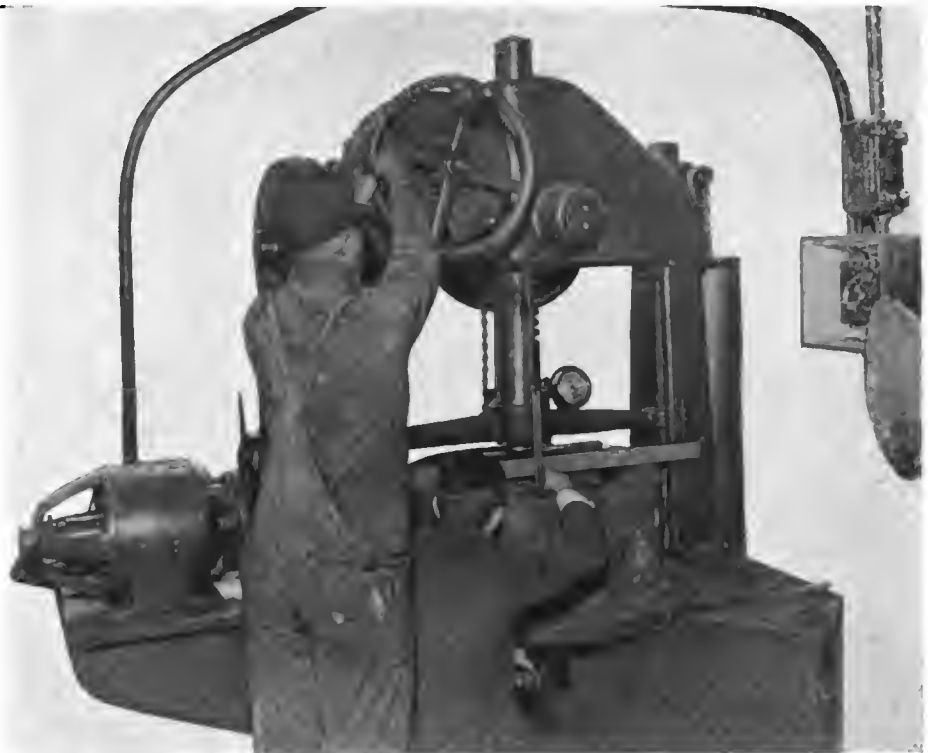
Anything other than single-piece casting was abandoned because of the difficulty of permanently assembling them, and to obtain strength and lightness was extremely important. What was desired was an entirely hollow casting that would have rigidity of structure against side thrust when applied to the rims, and resist stresses that would be imposed by any condi-

tion that might be met with in truck service. To conform to the generally accepted design of wheels the conventional proportions could not be greatly varied from.

#### General Description of Smith Types.

Without attempting to detail the different designs built and the tests made to determine strength, the construction as finally developed may be best learned by reference to the accompanying illustrations. That of the rear wheel will be the better for the following explanation. The wheel is cast with the core built in the mold and in such a manner that all of the walls are uniform in thickness, and securing the cores is a matter of great care, even with the most expert foundry men.

The hub is formed with a series of 12 openings from the bore (in which the axle hub is fitted) with



Smith Wheel Built for 38 by Six-inch Dual Tire Tested for "Dishing" in 50-Ton Press, with Indicator at Maximum Pressure, Deflected 1/32-Inch by Caliper Measurement from a Straight Edge at the Hub, the Wheel Returning to Its Original Form Upon Removal of Ram from the Hub.

flat, external sides. This hub is shown in the illustrations with a series of holes to which the hub flanges are bolted, and these holes are formed in the casting. The spokes, 10 in the front wheels and 12 in the rear wheels, have the vertex of the arches between them well rounded instead of sharp, and from the wall of the hub opening and from the wall at either side of the hub are webs that reinforce the hub structure. These may be noted in the cut-away section of a rear wheel. These webs are in the centres of the vertex of the arches and strengthen the hub against stresses that might result from pressure at the rim.

The walls of the spokes of front wheels increase in diameter, but not in thickness, close to the rim, and the walls of the rear wheels are widened with refer-

ence to the axes, until they are approximately the full width of the rims, having a decided flare until they are united with the rims. The precise forms will be noted by referring to the illustrations. This is the main difference in appearance between Smith wheels and conventional wooden types. The increase of the size of the spokes and the form of them affords a very broad support at the rim, there being much more metal in them than were they tapered from the hub to rim, which is the accepted design for wood wheels, and this affords a much stiffer construction and insures against vibratory stresses that might cause crystalization of smaller areas of metal.

#### Construction of the Rim.

The inner rim of the wheel between the spokes is slightly crowned from edge to centre and is merged into the spokes in curves. The edges of the rim are

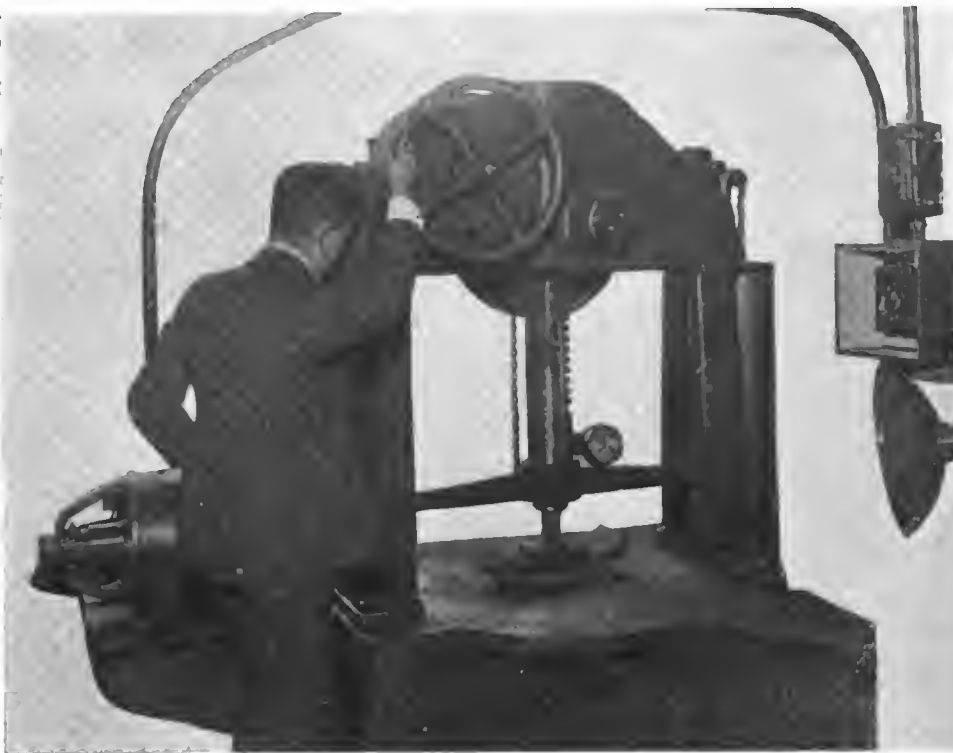
The reader will note from the sectional illustrations of wheels that substantial strength is insured under each spoke, the supports being carried upward so that the spokes are effectively braced against stresses from rim pressure. There are in the rear wheels three rows of supports between each spoke, or 72 in all, and two under each of the 12 spokes, or a total of 96 supports between the rims. Because of this construction the outer rim is made very thin, but this is reinforced by the steel rim carrying the tire, which amply protects it against damage from road shock. The metal walls of the wheels will average approximately  $5/32$  inch thickness, but the outer wall of the rim is about  $1/16$  thick when the wheel is finished.

#### Wheels Subjected to Many Tests.

After the wheel design had been determined by practical tests to be sufficient to endure under all loads

and all shock to which the wheels might be subjected, the proportion of the metal that was necessary was found in a similar manner. Nothing was assumed or accepted, even if based on thoroughly established engineering. The wheels were produced and subjected to tests for resistance to deflection under differing pressure. Both front and rear types were taken to the engineering department of Syracuse university and tested to the full capacity of the machines and very careful record made of the results.

All this was preliminary to the final development, which was worked out when the practical results were known, and meantime a great deal of careful attention was directed toward the casting. The character of the casting necessitated



Single Spoke Section of Smith Wheel Tested with 35 Tons Pressure, the Stress Being Shown by the Flattening of the Tire, Without Evidence of Failure.

straight and the outer periphery or surface of the rim is flat. The rim is hollow and within it, between the two metal surfaces, are a series of supports. These are formed like crosses with arms of equal length when shown in section, the angles affording great strength. Between the outer wall of the rim and the walls of the spokes is another series of supports in the form of crosses, with the arms that are transverse of the rim twice the length of those that extend circumferentially. The supports between the spokes are the same size section for the full length, but the transverse arms of the supports of the spokes are wider at the rim wall and decrease in width until they merge with the walls of the spokes, this design affording a support the greater part of the width of the rim for the hollow spokes.

ed working out an exact method of doing the work. The core must be accurately placed to obtain precise wall thickness, for the metal must be uniform throughout, and experience showed that the metal would not flow and form a perfect structure were there reduction of the walls when the molds were set up. And not only must the metal be of exact temperature, but it was necessary to pour it in 66 different places and 10 men were required to do this work.

#### Design Minimized Machining.

Though the casting was such that it could only be done by the most expert men, the method was found by experiment so that absolute uniformity was practically obtainable. In designing the mold there was another object sought, and that was to reduce the machining to the lowest possible degree, and so well



was this worked out that the machine work is principally working the periphery and edges of the rim and the side and bore of the hub to exact size, the metal being reduced but slightly and insuring perfect fitting of the tires, hubs and brake drums.

After the wheels are cast they are subjected to heat treatment that causes the metal to have a very fine texture and which is not affected by vibratory stresses. Were not this treatment given the casting strains, despite the extreme care to maintain uniformity of temperature in pouring the metal and in cooling the casts, might cause cracking. As treated the wheels have decided elasticity and remarkable strength.

While the patent for the wheels was granted April 11, 1916, and the first wheels were produced commercially early in May, the knowledge of endurance under test is very broad, for no vehicle could be subjected to anything like the loads that have been put upon those that have been experimented with. One set was on a truck laden with  $6\frac{1}{2}$  tons of pig iron that was deliberately driven into a heavy stone curb in endeavor to damage a wheel. The load was distributed without labor, but the wheel was neither bent nor broken. Many similar tests were made and trucks were heavily overloaded to destroy wheels if possible.

The reason for this was that Mr. Smith proposed to learn the weaknesses of the wheels at his own expense, and before one was sold, for he had confidence in his own invention and intended to manufacture on large scale, but he realized the necessity of proving every statement beyond question. In the company's plant is a hydraulic press that has capacity to 50 tons by gauge indication, although greater pressure can be obtained than the gauge will indicate. That is, after the indicating hand has reached the maximum of the scale the pumpage may be continued and the pressure will exceed the indication, probably to 60 tons, so that whatever this excess pressure may be it is not known, and is not considered.

With this press wheels of different types and construction have been tested to destruction, and in different ways. Because the height of the press above the bed is such that a wheel cannot be placed upright upon it the tests of complete wheels are necessarily limited to supporting the rims at points equi-distant and exerting downward pressure with the ram upon the rims; to supporting the rims in the same manner and forcing the ram downward upon the hubs, and,

with a half section of a Smith wheel, placing this on tire sections and with a bearing plate on the hub, forcing the ram downward on the centre of the plate.

#### Wheel Section Much Weaker.

One will understand that without the support of the upper half of the wheel and without the heavy tire rim that would encircle it, the strength of the wheel section is but a small part of what it would be were the wheel complete on a truck and supporting a load. A wood wheel section would have no strength whatever. Yet measured with a Brown & Sharpe multiplying micrometer gauge placed between the hub and the rim at the vertex of the arch between two spokes, there was, under 50 tons plus pressure, from .033 to .035 deflection. This may be stated as approximately  $\frac{1}{32}$  inch. How much more the section would endure without destruction is problematical. Upon release of



Half Section of Smith Wheel Tested with 50 Tons Pressure, the Indicator Between the Hub and the Rim Showing a Deflection of  $\frac{33}{1000}$  Inch, Without Change from Original Form When Taken from the Hydraulic Press.

the ram the wheel section resumed its original shape, not being permanently deformed, although the pressure was maintained for several minutes. This test has been many times repeated, but the wheel section has never yielded.

Another test was supporting the wheel at the rim on blocking and subjecting it to the fullest pressure of the press upon a small plate centred upon the side of the hub. The wheel showed a deflection of  $\frac{1}{32}$  of an inch with the press gauge standing at 50 tons, but there was no deformation, the wheel springing back to its original form upon the release of the ram. Still another test was taking a section of a front wheel, this consisting of a single spoke and a piece of rim to fit a piece of rim and tire, and subjecting the section to pressure varying up to 43 tons, there being no evi-

dences of failure apparent upon closest examination.

These tests are not uncommon, for the company will make demonstrations of the wheel at any time to those who are interested, and the officials seemingly regard them as necessary in proving the claims made for the wheels.

#### Deflection Under 50-Ton Load.

With reference to the degree of deflection shown with the application of pressure to the half section of a Smith wheel the following tabulation is especially interesting. The reading of the gauge is under the centre of the deflected arch, as shown in the illustration:

Pressure in Tons	Deflection in Inches
1 to 5	.002
5 to 10	.0046
10 to 15	.007
15 to 20	.010
20 to 25	.014
25 to 30	.0175
30 to 35	.019
35 to 40	.024
40 to 50	.033

The section subjected to this test was intended for a wheel to be equipped with a 40 by six-inch dual tire, such as might be installed on a five-ton truck. The whole wheel tested for hub deflection was the same size. In all of these trials of durability the deflection has been carefully checked and it has not varied appreciably, although the gauge is calibrated for the closest indication that is practical to work to for variance.

The company has produced a considerable number of sets of wheels and they have been carefully weighed. When finished and ready for delivery the weights are considerably less than wood wheels of the same size. An average of 10 per cent. less is probably a fair statement, although there is but little variance in the wheels. The saving in weight is not only an important factor with reference to power, but the economy in tires is equally worthy of consideration by truck owners. The cost of the wheels is also decidedly less than those built of wood, so that there is another fact that is pointed out—the initial economy that may be obtained. The company is building an extensive plant in Geddes street that will be equipped with every facility for production and which will be in

large part, if the present plans fructify, ready for operation before the opening of winter. This will include several two-story brick buildings of large size, which will house the drafting room, core room, foundry, machine shop and stock rooms and store houses, and the purpose is to operate on a very large scale.

The company has a considerable area of property and the plan is to increase its plant to whatever proportions are necessary to meet the demand for Smith wheels. The company has constructed several displays that are permanently located in the Onandaga hotel in Syracuse, the L. C. Smith building, a 40-story structure at Seattle, Wash., and in the Hotel Statler at Detroit, Mich., which are wheels equipped with tires and placed on cradles on extremely handsome tables. On these are inscriptions that set forth the claims for economies of the maker.

#### REFUSE \$750,000 AND FREE SITE.

The Kelly-Springfield Tire Company, through its representatives, turned down the offer of the city of Cumberland, Md., to furnish a site and \$750,000 for a new plant if the company would establish in that city its tire plant, which is being removed from Springfield, O. It is understood that the tire company offered to locate in Cumberland if the people would build and equip the plant, which would cost \$1,500,000.

#### MACK TRUCK FOR ALASKAN DAIRY.

While motor trucks are used by a number of dairies that is large when the entire country is included, yet are seemingly few when the dairy industry as a whole is considered. Those who are not familiar with Alaska assume that it is a region in which motor trucks cannot be used, the supposition being that in addition to the absence of highways there is a very long winter and an excessive fall of snow, which would prevent an extremely ambitious man from working with machines.

But, strange as the statement may seem, the Juneau Dairy, at Juneau, has in its service a one-ton Mack truck, which was bought for the purpose of distributing its products in the city and vicinity. Juneau is about 1000 miles north of Seattle and has a population of about 2000. The fact that the dairy company officials have faith in the utility of the machine, well knowing the conditions that it must be operated in, ought to be sufficiently assuring to those who have doubt of the practicality of trucks where the highways are reasonably well built and the weather is mild.



One-Ton Mack Truck Operated for Collecting and Distributing by the Juneau Dairy Company, Juneau, Alaska.

**AMERICAN CARS LEAD WORLD.**

William B. Nevin, manager of the passenger car sales for the Pierce-Arrow Motor Car Company, Buffalo, N. Y., says, "the end of the war will see American motor vehicles occupying a prominent place in trade of the world, both in passenger cars and trucks.

"Enough automobiles and trucks have been sold in Europe to make the parts business an enormous industry," Mr. Nevin says. "When the conflict ends all these vehicles will be turned to peaceful uses, millions of dollars worth of parts will be required.

"At the present time it is estimated that this country exports about one-fifteenth of the cars it manufactures. During the 12 months ending June 30, 1916, 77,496 cars were shipped abroad and their total value was \$97,464,381. Parts, tires and engines would bring the total up to \$140,000,000.

"Even assuming that the war's end will see a falling off in the volume of orders, the start that has been made will assure this country a huge amount of export business permanently, one that will make it possible to employ profitably the large additions that were made to plants to produce war orders."

**AHRENS-FOX FOR HAVANA.**

The Ahrens-Fox Fire Engine Company, Cincinnati, O., has been awarded a contract for nine motor combination fire pump and hose apparatuses by the city of Havana, Cuba. Vice President John P. Ahrens of the company is making a trip to Havana, accompanying the first machine shipped. The engines were tested at Cincinnati by the National Board of Fire Underwriters, this being one of the conditions of the contract.

**WILL SELL PIERCE-ARROWS.**

A. C. F. Keleher has become associated with H. H. May of Pittsburg, Penn., as half owner in the Pierce-Arrow agency in that city. The name of the agency has been changed to the May-Keleher Company. Mr. Keleher is well known in truck circles, having been one of the pioneers in the business.

**FENDERS FOR TRUCKS?**

Considerable agitation has taken place recently in New York City to compel owners of trucks to equip their machines with fenders as a means of preventing fatalities while the vehicles are used in congested streets. Demonstrations of several of the fender devices have been made with practical results.

**FEED PIPES FOR APPARATUS.**

Coal dealers in North Adams, Mass., have installed stand pipes running from the river to their coal pockets to furnish a supply of water for the new motor driven fire apparatus that the city has acquired in the event that there should be fires in the yards.

**SOUTH AMERICAN PROSPECTS.**

Thomas H. Klrker, export representative of the Chalmers Motor Company, who has just returned from a six months' tour of South American countries, says that the sentiment of buyers in those states has turned in favor of the American made machines and that there are between 500 and 1000 cars of European make standing in the warehouses unsold.

He says that unusual prosperity prevails in Argentina and many ranch owners are buying automobiles in half dozen lots to be used in their business. The only draw back to commerce with these countries, Mr. Klrker says, is the scarcity of ships and resulting high freight rates in force.

**BRICK ROADS CONSTRUCTION.**

Bulletin No. 373, issued by the Office of Public Roads of the United States Department of Agriculture, is an exhaustive treatise on "Brick Roads." The subject was handled by Vernon M. Peirce, chief of construction, and Charles H. Moorefield, senior highway engineer of the department. The history of brick roads in this country is given briefly and the results obtained from their use touched upon in an interesting style. Chiefly, however, the book deals with the modern construction of brick roads and gives details and specifications quite thoroughly.

**SAVE COTTON WITH TRUCK.**

A Federal truck, which had been purchased 10 days previous by C. E. Hutchinson of Mount Holly, N. C., was in rapid and continuous service recently when the Catawaba river threatened to overflow its banks. Several hundred bales of cotton were stored in the danger zone close by the river bank and the owner decided to remove them. After working the truck a stretch of 24 hours, the bales were all carried to safety, but hardly before the flood came and carried away storehouse, cotton mill and stores. The truck is now being used to transport the help to a town four miles away, where the cotton mill is being rebuilt.

**WANT ROAD APPROPRIATION.**

The Illinois legislature at its next session will be asked to grant a special election to enable the voters to authorize a \$10,000,000 bonds issue for the purpose of building a modern road from Chicago to Cairo, Ill. The work of petitioning the legislature has already been taken up by the Egyptian Trail Association, the National Old Trails Association and the Lincoln Highway Association in that state.

**GAS CHEAPER IN CHICAGO.**

Gasoline is selling at 15.6 cents a gallon in Chicago, which price shows another drop of one cent a gallon. This price is general throughout the State of Illinois.

**GASOLINE FIRE PUMPING ENGINES.**

W. M. Johnson of the engineering staff of the National Board of Fire Underwriters, in a paper on gas driven and steam pumping engines in fire department service, which he read at the recent convention of the Massachusetts State Firemen's Association, treated the subject without prejudice and entered exhaustively into the merits of the two different kinds of power in pumping water for fire fighting purposes.

In speaking alone of the capacity of the motor driven fire apparatus for pumping service, he said:

That the experimental stage in the design of automobile pumping engines has been passed is indicated by the service which the present machines are giving and the success with which they now go through the tests held annually at the conventions of the International Association of Fire Engineers. Of the 19 engines entered in these tests in the past three years, 17 have completed the runs, and none of them dropped out from engine or transmission trouble. They all pumped the full capacity for which they were rated at the prescribed pressures of 120, 200 and 250 pounds. I do not believe that 19 steam fire engines put through the same tests would make as good a record for continuous and steady service at full capacity. As a comparison between the performance of an automobile pumping engine and steam fire engines on test, there might be noted the results of tests of three new second-size steamers, rated at 700 gallons capacity, tested at Chicago in April, 1912, at which I represented the underwriters. The capacity tests of one hour's duration showed an average, for the three engines, of 725 gallons per minute, at a net pressure of 157 pounds. These results may be taken as representative of what may be expected of this size steam fire engine when in first class condition and skillfully operated. An automobile pumping engine of the same rated capacity was tested last year at the Cincinnati Convention of Fire Chiefs, and delivered on a six-hour test an average of 747 gallons per minute at a net pressure of 133 pounds, and the indications were that the engine could have delivered the same quantity at higher pressure.

The record of the steam fire engine for long continued pumping at fires has not been equaled as yet by the automobile engine, although their service at individual fires in several cities, at the Augusta, Ga., and Paris, Tex., conflagrations, indicates that they are capable of actual fire service over periods of many hours and the reports of the use of automobile engines for pumping for other purposes, such as during floods, show continuous runs long enough to warrant the statement that service can be obtained from the present types of automobile pumping engines as long as it is required if they are properly handled.

**HART-PARR ACTIVITIES.**

The "Hart-Parr Field and Factory," a publication in which the activities of the organization of the Hart-Parr company are recorded, contains an article this month on the part the Hart-Parr tractors took in the big national tractor demonstrations. There is also a brief account of how C. W. Hart and C. H. Parr came to found the big tractor industry at Charles City, Iowa. These two men started their business in a small shop in Madison, Wis., and moved to Charles City in 1901. Today the factory covers 22 acres and is devoted exclusively to the manufacture of tractors. After 15 years it is claimed by the company that over 90 per cent. of the first machines are still in service.

## TRAILER MANUFACTURERS.

At a meeting of representative trailer manufacturers of the country, held at the Hotel Statler, Detroit, Mich., Oct. 10, "The Trailer Manufacturers' Association of America" was formed, with the primary object of furthering the interests of the industry. Publicity and education to the uses of trailers will be taken up and an active campaign conducted.

The following officers were elected: President, C. A. Geiger, president of the Troy Wagon Works Company, Troy, O.; vice president, Miss Kate Gleason, secretary of the Rochester Trailer Company, Rochester, N. Y.; vice president, A. P. Warner of the Warner Manufacturing Company, Beloit, Wis.; secretary-treasurer, J. C. Endebrock, secretary of Sechler & Co., Cincinnati, O.

The companies represented and their representatives at the meeting were as follows:

Detroit Trailer Company, Detroit, Mich.; O. E. Byron and S. A. Griggs; Fox Trailer Company, Windsor, Ont.; Mr. Fox; Service Auto Trailer Company, Detroit, Mich.; R. E. Leppo; Rochester Trailer Company, Rochester, N. Y.; Miss K. Gleason and Mr. Elliott; Warner Manufacturing Company, Beloit, Wis.; J. W. Menhall; Rogers Brothers Company, Albion, Penn.; R. C. Steers and James E. Britton; Los Angeles Trailer Company, Los Angeles, Cal.; J. N. Patterson; Martin Rocking Fifth Wheel Company, Springfield, Mass.; C. H. Martin; Jahns Semi-Trailer Company, Detroit, Mich.; Messrs. Jahns and Kring; Troy Wagon Works Company, Troy, O.; R. C. Sykes and A. R. Miller; The Sechler & Co., Cincinnati, O.; C. W. Shipley and J. C. Endebrock; Watson Wagon Company, Canastota, N. Y.; A. A. Keesler; Miami Trailer Company, Troy, O.; W. F. Jolley, and Ohio Trailer Company, Cleveland, O.; W. E. Ferris.

C. W. Shipley, president of Sechler & Co. of Cincinnati, presided over the preliminary meeting and the organized meeting was presided over by A. A. Keesler, president of the Watson Wagon Company of Canastota, N. Y. After the permanent officers were elected they were also appointed as members of the executive committee, together with the following: S. A. Griggs of the Detroit Trailer Company, A. A. Keesler, president of the Watson Wagon Company, and James E. Britton of Rogers Brothers Company, Albion, Penn.

George B. Russel of the Russel Motor Axle Company, Detroit, spoke of the needs that impelled the organization of the Internal Gear Drive Association and its systematic publicity and educational campaign. He told of the excellent results obtained and the members of the association decided to inaugurate a similar campaign. Devising the ways and means of carrying it out was left to the executive committee.

Recognizing the desirability of having trailers properly classified and listed in railroad classification, a freight committee was appointed, consisting of the following members: J. W. Menhall, Warner Manufacturing Company, Beloit, Wis., for

central classification; W. F. Jolly, Miami Trailer Company, Troy, O., for southern classification; J. N. Patterson, Los Angeles Trailer Company, Los Angeles, Cal., for western classification, and C. A. Geiger, Troy Wagon Works Company, Troy, O., for eastern classification.

## S. A. E. WINTER MEETING.

The winter meeting of the Society of Automobile Engineers will be held in New York City during the week of the National Automobile Show, Jan. 7-13 inclusive. The meetings will be held in the Engineering Societies' building, 29 West 39th street, and the business sessions will occupy only part of four days.

The professional programme will be short as compared with previous winter meetings and there will only be three or four good papers, which will be printed in advance. They will not be read in full, only 15 or 20 minutes being allowed the speakers to present digests of their subjects and from 30 to 45 minutes will be allowed for each discussion. These papers will be presented on S. A. E. day of the show, Thursday, Jan. 11. The session will be begun at 10:30 a. m. and end at 4:30 p. m. If the discussions are not completed an adjourned session will be held the following morning at 10 o'clock.

The annual dinner will be held the Thursday evening of the week on the top floor of the Hotel Biltmore. A reception will be held at 6:30 and the dinner at 7:30 p. m. There will be three prominent speakers following the dinner and at midnight the members with their wives will attend a performance of Ziegfeld's Midnight Frolic on the top floor of the New Amsterdam theatre.

The various divisions of the Standards Committee of the S. A. E. will present their reports at the business meeting on Wednesday, Jan. 10. Two interesting divisions of electric equipment work will be discussed, the standards for head lamps and standard flanges for mounting generators and starting motors. The Tire and Rim Division and the Aeronautical Engine Division will make their first reports.

## STIGER NEW M. A. M. HEAD.

C. W. Stiger of the Stromberg Motor Devices Company was elected president of the Motor and Accessory Manufacturers at a meeting of the board of directors of that organization held Oct. 13. Mr. Stiger succeeds Mr. F. Hallett Lovell, Jr., who recently resigned. Mr. William M. Sweet, who is to become assistant to the president of the United Motors Corporation, tendered his resignation as secretary of the organization. Mr. Sweet was elected a member of the board of directors to succeed Mr. Lovell and also chairman of the 1917 banquet committee. Christian Girl of the Perfection Spring Company, Cleveland, O., was elected a member of both the executive and finance committees, and William C. Rands of the Motor Products Corporation

was elected to the directorate to succeed C. E. Whitney, resigned.

The directors voted to affiliate the organization with the Chamber of Commerce of the United States and the following new members were admitted: A-B-C Starter Company, Detroit, Mich.; Celfor Tool Company, Buchanan, Mich.; Corning Glass Works, Corning, N. Y.; Detroit Weatherproof Body Company, Detroit, Mich.; Evapco Manufacturing Company, Detroit, Mich.; Gillette Motors Company, Mishawaka, Ind.; The Hall-Thompson Company, Hartford, Conn.; Lipman Air Appliance Company, Beloit, Wis.; Morse Chain Company, Ithaca, N. Y.; New York Coil Company, New York City; Perlman Rim Corporation, New York City; Rubber Insulated Metals Corporation, Plainfield, N. J.; Universal Shock Eliminator, Inc., New York City; Wagner-Hoyt Electric Company, New York City.

## L. M. BRADLEY WITH M. A. M.

L. M. Bradley, who has been connected with several of the leading automobile manufacturers of the country, has been elected general manager of the Motor and Accessory Manufacturers, Inc., to succeed William M. Sweet. Mr. Bradley was affiliated with the old American Motor Car Manufacturers' Association of New York, which was organized by Henry Ford and others to fight the Selden patents. He was also at different times connected with the United States Motor Company, Studebaker Corporation, the Willys-Overland Company and the Moline Automobile Company, and recently was advertising manager of the American Motorist, Washington, D. C.

## WALKER COMPANY SELLS PLEASURE CAR DIVISION.

The Anderson Electric Car Company of Detroit, Mich., has purchased the pleasure car division of the business of the Walker Vehicle Company, Chicago. All new Chicago electrics completed and those in process of manufacture, together with all parts and service, will be taken over next month by the Anderson Company.

Hereafter the Walker Vehicle Company, which is owned by the Commonwealth Edison Company, will confine its operations to the manufacture and selling of Walker electric trucks. The Anderson company has engaged Gail Reed, general sales manager of the Walker company and a number of other officials of that concern to promote the sale of pleasure cars.

## ROBERT S. CRAWFORD DEAD.

Robert S. Crawford, one of the pioneer bicycle and automobile manufacturers, died in Pittsburg, Penn., on Oct. 12. Mr. Crawford for many years operated a large bicycle factory at Hagerstown, Md., and was the founder of the Crawford Automobile Company, builder of pleasure cars and trucks. He is survived by two daughters and one brother.



## TWO CAPACITIES OF 1917 COMMERCE TRUCKS.

**C**OMMERCE trucks in two sizes will be built the coming year by the Commerce Motor Truck Company, Detroit, Mich., one of which is a continuance of the model N, and the other is model E. This concern, which is now in its seventh year and is widely known as one of the well established units of the industry, up to the present time adhered

many manufacturers because they are uniformly efficient and satisfactory and have every practical quality to recommend them. Such components have been developed by engineers of ability and through conscientious periods of experimentation and from continuous observation during actual service.

Practicality is the first consideration of the business man, who is unwilling to accept what is in any way experimental, and dependability can only be determined by actual knowledge of results. This being so, the sound judgment of utilizing units that have been proven is thoroughly established. Not only this, units that are well known and conform to conventional practice can be readily adjusted and restored in almost any garage or service station by mechanics who may never have seen the particular machines in which they are incorporated.

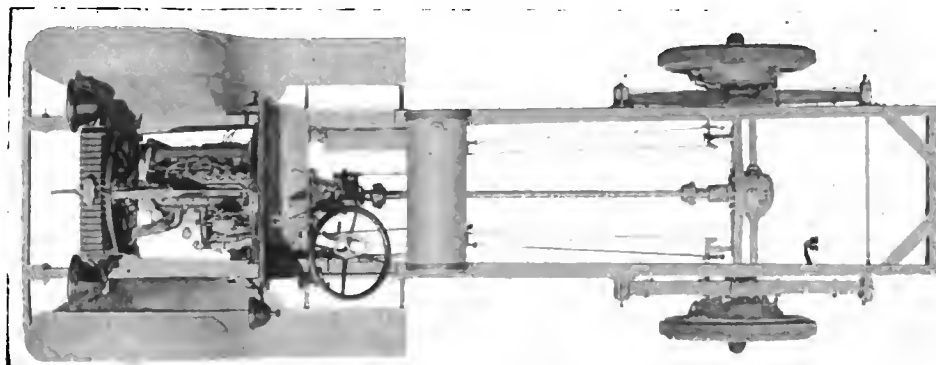
One of the results of the policy of standardization has been the adoption of the same type power plant for both chassis. It is a unit

in which the clutch and the transmission gearset are combined, and which is suspended at three points, being supported at the front by a trunnion mounted on a special cross frame member, and carried in arms seated on the frame side members at the rear, so that it is protected against stresses from chassis distortion and there can be no misalignment that will reduce the effective transmission of power.

### Same Engine for Both Chassis.

The engine is a Continental model N, which is a four-cylinder, four-cycle, water cooled, L head type, with cylinder bore of  $3\frac{1}{2}$  inches and stroke of five inches, the ratio of bore to stroke being 1:1.427. The engine is rated by the S. A. E. formula at 19.60 horsepower, but because of the long stroke the manufacturer claims that it will develop 23 horsepower at 1000 revolutions and 34 horsepower at approximately 2000 revolutions, so that there is really far greater capacity than would be used save in extremely unfavorable conditions. In any event the engine has a reserve much in excess of what would be required by the most exacting buyer.

The cylinders are cast en bloc, with the head of the water jacket open, and the water jacket is completed by installing a large cast cover plate that is channeled from ends to the centre to insure full flowage of water to the outlet manifold. This plate is retained by a series of cap screws. The valves are at the right side of the engine block. The cylinder block, cover plate and pistons are cast from a superior quality of gray iron and all are extremely well finished. The pistons are made four inches long and with walls  $\frac{3}{32}$  inch thick. The pistons are channeled for three eccentric compression



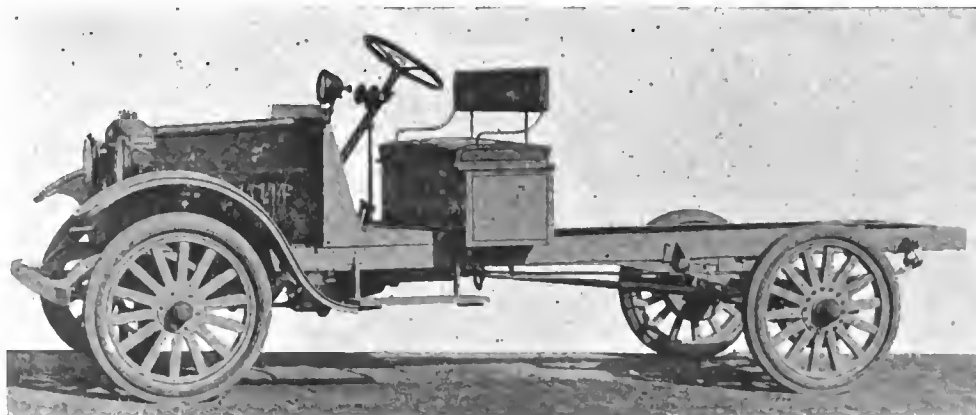
Top View of Model E Commerce Chassis, Showing the Unit Power Plant and the Transmission System and Rear Axle.

to a policy of producing but one type, which was standardized, but to better meet a demand for a somewhat larger vehicle the model E was decided upon and this is now being produced commercially.

The model N delivery wagon has normal load capacity of 1500 pounds, but the model E is nearer to a truck type, having somewhat more substantial construction and capacity of 2000 pounds. The main difference between the two machines is that the model N is driven by a three-quarters floating rear axle, and the model E is driven by a Torbensen axle, this being an internal gear type. Of course the components of the model E vehicle are somewhat larger and there are minor differences that will be referred to during the consideration of the two machines.

Statement should be made that the company has planned to produce these vehicles in large numbers and its distribution has been very carefully organized, there being Commerce representatives in practically all parts of the country. The model N is the sixth and the model E is the seventh distinct machine the company has perfected, and both have been designed to meet the requirements of that very large class of business men who must have fast and light delivery, which will afford long daily mileage and which can be operated for comparatively small expense. In fact, the purpose has been to produce vehicles that will have unusual quality, and only by building these in large numbers can the high quality be maintained, especially when the prices of both labor and material have steadily increased.

Construction of machines that will be suited to practically all purposes and which will be equally serviceable in a very wide range of operating conditions has been possible by careful development, with a view of obtaining extreme simplicity and accessibility, so that the vehicles can be maintained with minimum labor and maintenance expense, and they can be operated for very low cost. Of course endurance is a primary object and this could only be insured by the use of constructional units that are produced by some of the best known specialists of the motor vehicle industry. These units will be recognized by those having knowledge of the industry as standard—that is, they have been adopted by



Side View of Model E Commerce Chassis, Complete, Ready for the Installation of Either Standard or Special Body.





The Torbensen Drive—Internal Gear—Rear Axle and the Manner of Mounting the Springs of the Model E Commerce Chassis.

rings, located above the wristpins, that have  $\frac{3}{32}$  inch faces. The machine work and method are with reference to obviating casting strains, all the parts are carefully tested, and the work on them is to very close limits.

The crank case is in two sections, the upper part being cast from aluminum alloy. This carries a central vertical transverse web in which is seated the centre main bearing, and it is formed with a bell housing that encloses the flywheel on which are the rear supporting arms of the power plant. The lower section of the crank case, which serves principally as an oil reservoir, is pressed steel, this being lighter and stronger than cast metal. By removing a series of bolts this oil reservoir may be lowered and the main and connecting rod bearings reached for work or examination. There is an opening at the left side of the flywheel housing for installing a starting motor, this being covered with a plate in the model N chassis.

#### The Reciprocating Parts.

The crankshaft is made of high grade steel, carefully machined and ground, which is carried on three bearings that are, from front to rear,  $2\frac{3}{16}$ ,  $2\frac{7}{32}$  and  $2\frac{1}{4}$  inches diameter, and are respectively  $2\frac{9}{32}$ ,  $2\frac{1}{2}$  and three inches length. The flange to which the flywheel is bolted is forged integral with the crankshaft. The main bearings are nickel babbitt mounted in bronze shells. The connecting rods are I section steel drop forgings that are bored and reamed on special machines to insure perfect alignment. The wrist pins are chrome nickel steel that are hardened and ground. The crank pins are  $1\frac{1}{8}$  inches diameter and  $2\frac{3}{32}$  inches length. The connecting rod bearings are nickel babbitt and are fitted with steel shims, the caps being retained with nickel steel bolts, the nuts being securely locked. The wrist pins are bushed with phosphor bronze, the pins being  $1\frac{3}{32}$  inches diameter and  $1\frac{1}{2}$  inches length. The pins are held stationary in the piston bosses by a locking device that has its bearing in the large bronze bushings.

The camshaft is a single piece steel drop forging that is mounted on bearings of white bronze, the forward bearing being  $2\frac{5}{8}$  inches diameter and the rear  $1\frac{1}{2}$  inches diameter, these bearings being respectively  $1\frac{7}{16}$  and  $1\frac{3}{4}$  inches length. The valves are interchangeable, having nickel steel heads welded to carbon steel stems, the stem ends being hardened. The valves and the valve tappets are mounted in substantial guides. The tappets are the conventional mushroom type, and they

are adjustable by screws and check nuts. The valve mechanism is enclosed by steel cover plates that are retained by winged nuts. The timing gears are helical cut and are practically noiseless in operation.

#### Lubricating and Cooling Systems.

The engine is lubricated by a combination force feed and splash system common to all Continental engines, the oil being supplied to the reservoir through an outside filler. It is forced by a horizontal plunger pump driven by an eccentric from the camshaft through copper tube to the timing gears and the rear main bearing. The lubricant drains to the oil pan, where it accumulates in troughs into which the big ends of the connecting rods sweep, distributing the oil to the main, camshaft, connecting rod and wrist pin bearings, the piston and cylinder walls and the valve tappets. The camshaft is insured lubrication from oil pockets in the wall of the block and the wrist pins are lubricated from oil trapped in openings in the ends of the connecting rods. The volume of oil in the reservoir is indicated by a float operated gauge.

The engine is cooled by a thermo-syphon circulation of water through the water jackets and a special built radiator that has capacity in excess of four gallons. The radiator has finned steel cast top and bottom tanks and pressed steel water columns, with a large filler cap. It is mounted on a frame cross member and can be quickly removed or installed. Radiation is promoted by a fan mounted on an adjustable bracket carried on the forward end of the cylinder block that is driven from a pulley on the forward extension of the magnetic shaft by a flat belt. The carburetor is an automatic float feed type (Zenith O 4) and the ignition current is supplied by an Eisemann high-tension magneto.

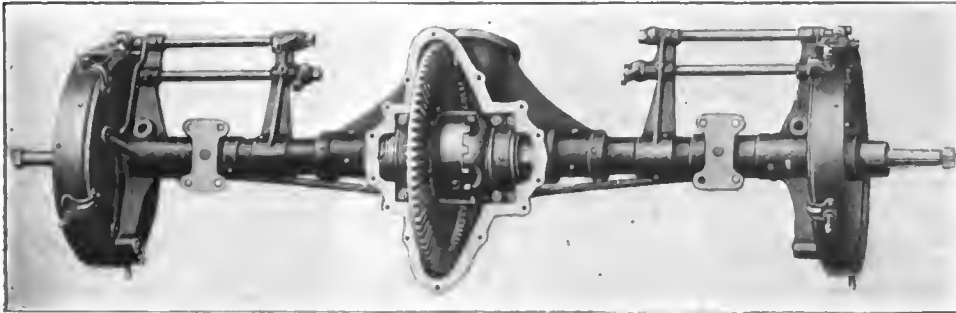
#### The Power Transmission System.

The clutch is a cone type, leather faced, 14 inches diameter, and this is assembled with the gearset, which is a selective construction that has three forward speed ratios and reverse. The shafts and gears are large, the gears being chrome nickel steel with  $\frac{3}{4}$  inch faces. The shafts are mounted on liberal bearings.

From this point the construction of the two chassis differs somewhat, and that of the model E will be described. The drive is by a tubular shaft,  $1\frac{1}{4}$  inches diameter, with walls  $\frac{3}{16}$  inch thickness, with universal joints at either end, made by the Arvac Manufacturing Company. The universal joints are built of steel drop forgings with felt washers and circular wire springs for retaining the lubricant. The rear axle is a Torbensen drive—internal gear—type, there being a solid drop forged I section member that carries the load, on which the wheels are mounted, which also carries the live axle or jackshaft at the rear. The drive is through bevel pinion and gear and a bevel gear differential gearset and shafts that carry pinions that mesh with the internal spur gears that are within the brake drums and protected against dust, mud, water or any other influence for deterioration. The pinion and driving shafts and the differential gearset are mounted on Bower or Bock roller bearings of large proportions. The axle



Model E Commerce Chassis Equipped with a Standard Express Body Fitted with Flare-boards, to Which a Top May Be Added.



The Semi-Floating Rear Axle of the Model N Chassis with Cover Removed to Show the Master Gear and Differential Gearset.

is considered to be very efficient and extremely enduring. The front axle is an I section steel drop forging. Both the rear and front axles are equipped with Bower roller bearings.

#### The Frame and Other Details.

The frame members are pressed from 3/16 inch high carbon steel having tensile strength of from 60,000 to 80,000 pounds to the square inch. The frame is 4½ inches deep and the webs are two inches width at the rear, 3½ inches at the centre and 2¼ inches at the front. It is reinforced with heavy cross members and large gusset plates. The frame is suspended on semi-elliptic springs of high grade, the front set being 36 inches length and 2¼ inches wide, and the rear set is 50 inches length and three inches wide. The springs are mounted on very heavy hangers. The spring eyes and shackles are bushed with bronze and oil cups insure the lubrication of the spring bolts and eyes.

The wheels are wood, artillery type, with square spokes, having 1¼ inches section. The wheels are fitted with solid tires, 34 by three inches forward and 34 by four inches rear. Pneumatic tires are supplied at extra cost, these being 34 by 4½ inches forward and 35 by five inches rear. The steering wheel is at the left side. The gear is the Jacox construction, this being a double worm and split nut type. The hand wheel is 18 inches diameter. The drive is the Hotchkiss system, the rear springs taking the torque and braking stresses. The control is by the usual foot pedals that operate the clutch and the service brake, gearshifting and emergency brake levers in the centre of the floor board at the driver's right, and ignition and throttle hand levers on the steering wheel. The brakes operate on drums on the rear wheels. The service brake is external contracting with bands 16 inches diameter and 2½ inches wide, and the emergency brake shoes are internal expanding, the shoes being 15½ inches diameter and 2¼ inches wide. The wheelbase is 126 inches and the tread the standard 56½ inches. The frame is fitted with a very rigid bumper that protects the radiator and fenders.

The engine is equipped with a Remy electric starting and lighting system, which includes a Willard battery of large size. The fuel is supplied to the carburetor through a Stewart vacuum system, and the supply is drawn from a 15-gallon welded steel tank under the driver's seat. The chassis is equipped with electric side and tail lamps and a search lamp that is pivoted to convenience the drivers finding street signs and house numbers at night.

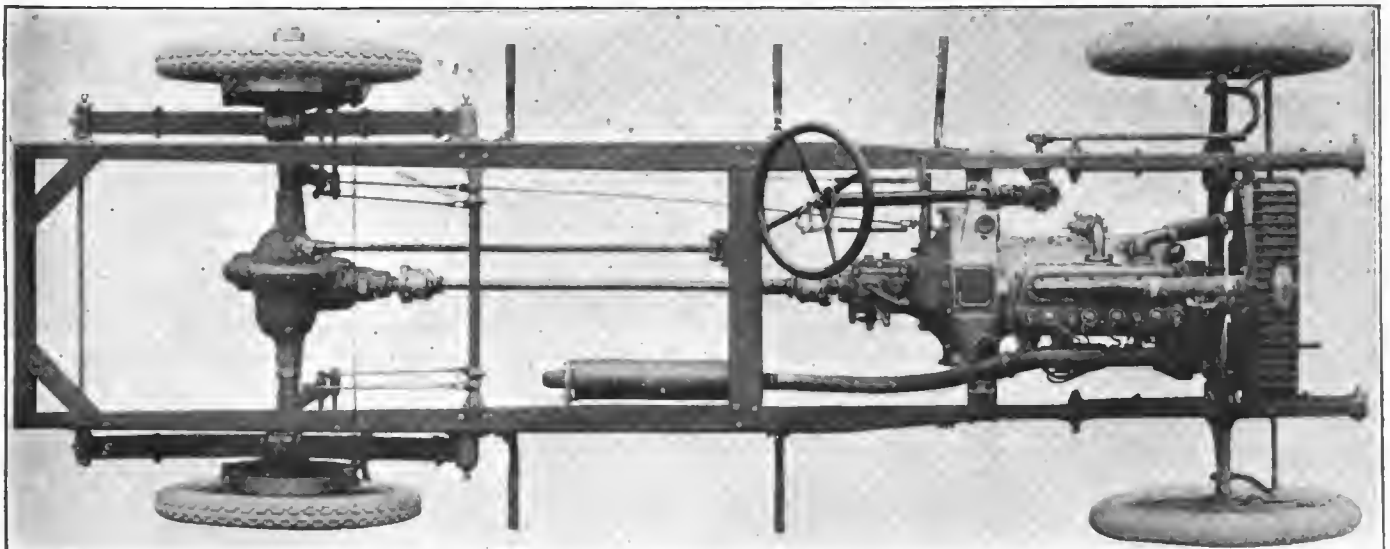
The standard bodies are model

A, an express type, without top, and the model H, which has the same body with a four-post standing top and full storm curtains. The chassis with full equipment, driver's seat and governor, is sold for \$1175, and an allowance of \$50 is made for starting and lighting system if this is not desired. The price for the model A body is \$60 additional and the model H body \$100 additional. A chassis can be supplied with a driver's cab, for which no quotations has yet been made. The deliveries of the model E chassis will be begun Nov. 15.

#### Details of the Model N Chassis.

The model N chassis is equipped with a solid driving shaft that has universal joints at either end, these being fully protected. The axle is a three-quarters floating type, with bevel gear drive, the axles being 1¾ inch chrome vanadium steel and mounted on large Hyatt roller bearings. With this construction the shafts may be removed without taking off the wheels or disassembling any part of the assembly. The torsion rod is a double truss construction, having a swivel mounting on a frame cross member with compensating clips. The frame is a pressed steel channel section, with large cross members and gussets, that is mounted on semi-elliptic springs 36 inches length and 2¼ inches wide forward and 50 inches length and three inches wide rear. All the spring eyes are bronze bushed and all spring clips are nickel steel and fitted over semi-circular spring saddles. The front axle is an I section with large spring seats. The steering gear is at the left side and the control levers at the centre. There is a throttle lever on top of the 18-inch hand wheel. Both sets of brakes are on the rear wheels, these being internal expanding and external contracting in and on drums 16 inches diameter and 2¾ inches width. The brake shoes are lined with asbestos.

The wheels are wood, artillery type, fitted with 34 by four-inch pneumatic tires, those on the rear wheels being non-skid, on demountable rims. The wheelbase is 120 inches and the tread 56 inches. The chassis is sold, with a choice of

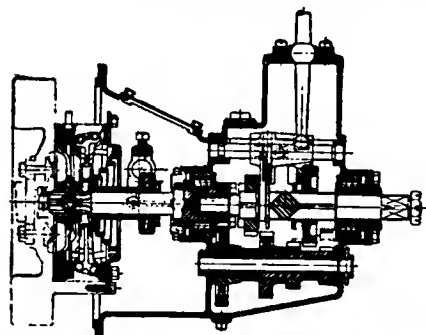


Model N Chassis Stripped to Show the Unit Power Plant, the Transmission System, the Brake Connections, the Rear Axle and the Spring Mounting, and the Frame Construction.

three types of body, with full equipment, for \$975. The bodies are designated by models, NC being ash framed and full steel panels, with either double doors with windows, or tail gate. The loading space is 84 inches long, 44 inches wide and 54½ inches high. Model NH has a four-post standing top with flareboards, the tops being quickly removable, with storm curtains, having the same loading space as model NC. Model NA is an open express body with flareboards, 84 inches long and 44 inches wide. The chassis are sold complete with wind-shield, hood, fenders, running boards, gasoline tank, dust shield, lamps, tools, pump, jack and tire repair kit. When desired special bodies are built to meet the owner's requirements.

#### COVERT MODEL L TRANSMISSION.

The Covert Gear Company, Lockport, N. Y., is now producing a new transmission gearset, designed for use in light trucks and pleasure cars having unit power plants, that is known as model L. While in general it conforms to the design of Covert gearsets previously built, it is much refined in detail. The gears are large and intended to endure heavy service. The stub teeth have pitch of 7/9 inches and the faces of the gears are ¾ inch width. The speed reduction on first ratio is very low, 3.61 to 1, this affording a very great reserve. The gearing forgings are special nickel steel, and after cutting and finishing they are heat treated and tested for



Covert Model L Transmission Gearset for Light Trucks and Pleasure Cars.

hardness to check the heat treatment. The gears are then ground and mounted on shafts and inspected as to pitch line. Unless they run perfectly true they are rejected. When the gearsets have been assembled they are tested for noiseless operation and if noise is developed the unit is

disassembled and the cause eliminated.

The shafts are alloy steel, heat treated, ground and inspected with the same care as the gears. The main shaft is a square section with mean diameter of 1½ inches, so there is no deflection under load. The lay shaft is hollow and has the reverse pinion integral with it. This is mounted on roller bearings mounted on a pin passed through the hollow shaft and supported by bosses at each end of the car. The reverse idler and the forward end of the square main drive shaft are mounted on Hyatt roller bearings. The rear end of the main shaft is on a double-row annular ball bearing that will take thrust in either direction. The driving pinion is integral with the clutch shaft and is fitted with a flexible roller bearing at the rear end and a suitable bearing in the flywheel.

The control set gear shaft lever is mounted on the cover of the gearset case and operates on a ball joint. At one side, also mounted on the cover, is the emergency brake lever and the locking ratchet. The short arm of the emergency brake lever is separate and is bent at the top at right angle, forming the brake lever shaft, the bosses carrying the shaft being attached to the gearcase cover, so that the case itself is free of bosses. When a transmission brake is fitted a bell crank is set at 90 degrees from the lever, which places the brake pull rod eye in the correct relation.

The gears are shifted by two yokes, drop forged, separated by a steel shifting rail slidable on hardened and ground shafts that are locked in the case. The forged yokes are locked in neutral position by a hardened steel ball so held by the shifting rail that but one yoke can be shifted at a time. The gear is locked by a steel ball that engages both the yoke and the shaft and is held by a coil spring.

The clutch is a floating ring type and carries a steel disc that may slide axially on the transmission shaft, together with two raybestos fibre rings, one of which takes the friction between the floating ring and the steel plate when a slid-

ing hub is pressed into position by a coil spring. Because of the leverage on the arm slight pressure on the clutch pedal will release the clutch, but when the arms are pressed into the driving position there is a positive lock between the driving unit and the transmission. No damage can be done by slipping the clutch, as the load is taken by the hardened steel plate and the raybestos surfaces; neither can the flywheel or the floating ring slip. Two screws, accessible from the bell housing, afford adjustment. Making adjustment the screws are loosened, the clutch released and the plate carrying the screws turned toward the right. Because of the positive lock, that it may be slipped without damage, the easy control and quick adjustment, the clutch is particularly adaptable to any form of service. The pedals are malleable castings, I section, of suitable length and shape. The standard for the bell housing is the No. 4 S. A. E., but adaptations can be made for engines not having the S. A. E. standard flange, and in some cases variance from this construction is made.

#### NEVER-SKID DUAL TIRE DEVICE.

The Never-Skid Manufacturing Company, 122 Liberty street, New York City, is producing an attachment that is known as the Never-Skid device for dual tires that is designed especially for use with truck having dual tire equipment. This consists primarily of a chain that encircles the wheel circumferentially between the shoes of the dual tire, which at intervals carries a series of cross pieces that are mounted at right angles to the chain.

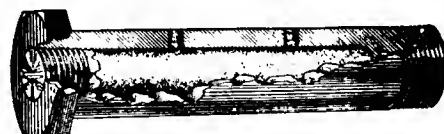
These cross pieces are constructed of woven steel wire of finest quality, so that they are practically unbreakable, save through wear, that have comparatively large areas that contact with snow or ice. The ends of these cross pieces cross the treads of the shoes and are of such width that they cannot damage the tires. The chains are fitted with turnbuckles to adjust them in the event of the tires wearing. The chains can be put on without jacking the wheels and are easily attached with special tools. They are made for different sizes and makes of tires. The manufacturer guarantees that the device will not damage wheels or tires and that they cannot foul driving chains.



The Never-Skid Device for Dual Truck Tires.

#### AUTOMATIC LUBRICATING BOLT.

The Brown Company, Syracuse, N. Y., is manufacturing under exclusive license an automatic lubricating bolt, patent for which was recently granted to David Landau of New York City and H. G. Farr of Springfield, Mass. Though new in the trade it has been tested for three years. It was first designed as a spring shackle bolt, but it can be equally well utilized for mechanism that requires a continuous feed of fluid oil for internal lubrication. The bolt is hollow, and in this bore is placed a wick of felt that is positively attached to a threaded cap plug and one or more feed or filter wicks. The wick in the reservoir of the hollow bolt is under slight compression, that forces all surfaces of the wick into contact with the walls, and the feed and filter wicks rest against the main wick and by capillary action carry the oil to the bore in which the bolt is installed. The reservoir wick is made a sucking fit in the hollow bolt and thus for filling the bolt with oil is made into an efficient pump.



Automatic Lubricating Bolt, Made by the Brown Company, Syracuse, N. Y.

## THREE SIZES IN NEW SERIES KREBS TRUCKS.

**T**HE SERIES of vehicles built by the Krebs Commercial Car Company, Clyde, O., consists of three sizes or capacities, these being rated at  $1\frac{1}{2}$ , two and  $3\frac{1}{2}$  tons respectively. The machines are not built to a single design, as they differ from each other slightly, but in the main one may say that the same principles have been followed in all



The Components of the New Type Plain Tube Radiator Installed in Krebs Trucks, Showing the General Manner of Construction.

the vehicles. These truck designs were carefully perfected, much time and care being taken to develop types that would afford a large degree of efficiency and extreme endurance.

In appearance the trucks do not resemble the previous series because the French or Renault hood and radiator has been replaced by the more general construction ahead of the engine, which makes a material change. The old series was made up of machines of 1500, 2000, 4000 and 6000 pounds capacities, so that the sizes of the three now built will practically meet every demand that may be made save for the heaviest types.

### Policy of Company Unchanged.

The policy of the company has not been changed because of the production of this new series, for the machines are constructed of units that are widely known and are regarded as standard by the industry and all owners and users of trucks, and care has been taken to build with unusually large factors of safety with no material increase of weight. All of the trucks are worm shaft and worm wheel driven and the units include Continental engines, Brown-Lipe clutches, Brown-Lipe transmission gearsets, Timken rear and front axles, Ross steering gears, Prudden wheels, Bosch ignition systems and Zenith carburetors.

But in addition the proportioning of the different components has been carefully worked out so that the machines are equalized so far as parts are concerned and for this reason there ought to be greater endurance and less probability of failure from heavy and continuous service in the most unfavorable conditions, for it is the policy of many owners to work their machines to extremes and without the attention that might be desirable.

The trucks are all equipped with the Krebs governor, which is an exclusive construction with this company, and which affords practically automatic vehicle control. This governor is a centrifugal type that is coupled with both the carburetor and the magneto, so that a precise relation always exists between the

firing of the cylinders and the volume of fuel that is supplied to the engine. This governor is adjusted at the factory to afford a maximum speed determined by the owner and when used the control lever is set for a definite speed between the maximum and minimum of the available range.

The driver then has the use of the variations of speed up to the point that is limited by the governor, and when that limit is reached the supply of fuel will be reduced automatically, so that it will not be exceeded. In other words it is a governor that has the quality of limiting speed to any maximum that may be desired, and when it has been set the driver does nothing but steer. One will understand that this relation of firing point and fuel supply is determined by careful tests and observation by factory experts and when it has been adjusted a standard of fuel consumption and power production has been established which insures large economy.

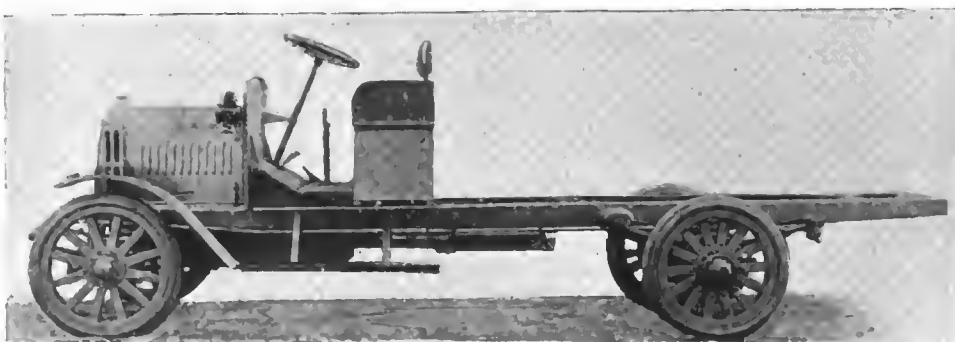
One of the most common causes of excessive gasoline consumption is the poor judgment of the driver as to the setting of ignition and throttle levers where the greatest power for a given volume of fuel may be obtained, and this means that because of absence of a standard relation both gasoline and lubricant are burned unnecessarily. The Krebs governor thus has two functions—limiting the speed and minimizing the use of fuel, and this is done automatically.

### Some Features of Construction.

The  $1\frac{1}{2}$ -ton and the two-ton trucks have the same size engine, this being a four-cylinder, four-cycle, water cooled, L head type with the cylinders cast en bloc, the bore being  $4\frac{1}{2}$  inches and the stroke  $5\frac{1}{4}$  inches, which by S. A. E. rating has 27.25 horsepower. In the  $1\frac{1}{2}$ -ton machine this is incorporated with a Brown-Lipe dry disc clutch and a Brown-Lipe four-speed ratio transmission gearset into a unit power plant that is suspended at three points. The engine is cooled by water forced by a centrifugal pump through a plain tube radiator that is built of 224 copper tubes with top and bottom finned tanks. The joints of the cooling section are gasketed and no solder is used to retain the tanks to the core. The drive is by a shaft with a universal joint at either end. The drive is the Hotchkiss system, the springs taking the torque, driving and braking thrust.

The two-ton chassis differs from the smaller type in that the transmission gearset is independent of the engine, being suspended in the centre of the chassis, with the driving shaft in two sections and universal joints at the couplings. The chassis parts are larger and heavier and the drive may be the Hotchkiss system or with radius rods as purchaser may elect.

The  $3\frac{1}{2}$ -ton chassis has an engine with cylinder bore of  $4\frac{1}{2}$  inches and stroke of  $5\frac{1}{2}$  inches, with the cylinders cast in pairs, that has a horsepower rating of 32.4 by the S. A. E. formula. The power transmission system is the same as the two-ton chassis, but this construction is fitted with radius rods. The two smaller chassis may have either right or left side drive, but the larger is driven from the right side. The wheelbases of the machines are respectively 144, 162 and 180 inches. The prices of the chassis are \$2050, \$2375 and \$3250 in the order of sizes.



Stripped Chassis of Krebs Truck, Showing the Changed Form of the Hood and Radiator and the Hotchkiss Type of Drive.



**UNION PRODUCTS COMPANY.**

The Union Products Company, Rockford, Ill., incorporated with capital of \$200,000, has obtained an exclusive manufacturing license on patent No. 1,195,279 of Aug. 22, 1916, of D. D. Shierk of a patent piston ring which will constitute the principal product of the company for a time at least. Exclusive licenses, however, have also been obtained on six patents issued and four that are pending, covering the manufacture of automobile and other kinds of wire wheels.

Building plans for a factory have been completed and the work on special machinery is being pushed ahead as rapidly as possible.

A. A. Martin, formerly vice president of the Burd High Compression Ring Company, Rockford, Ill., is president and general manager of the Union Products Company. M. R. Harned is vice president and H. F. Norris secretary. W. R. Williams, consulting engineer of the American Steel Foundries Company, and well known as a patentee of labor saving machinery, is chief engineer.

**CADILLAC AUTO TRUCK COMPANY.**

The Cadillac Auto Truck Company of Cadillac, Mich., manufacturer of Acme one and two-ton trucks, is erecting an addition to its factory to provide facilities for increasing production.

This new plant, which will be of concrete, steel and brick construction, will be 96 by 176 feet and when completed will afford the room necessary for the manufacture of a 3½ model Acme that will be placed on the market by Jan. 1.

The new model in general appearance, design and construction will be almost identical with that of the lighter models of Acme trucks, but will have larger units to fit it for carrying the heavier loads. The specifications of the new model have not been announced as yet, but will be given out at an early date.

**NATIONAL AUTO SHOWS.**

That the 1917 national automobile shows at New York and Chicago will be the largest ever held was indicated at the drawing for space at a meeting of the National Automobile Chamber of Commerce in New York City. Over 100 different manufacturers were represented at the drawing, which was presided over by Charles Clifton. Practically every foot of space for the show at the Grand Central Palace in New York City beginning Jan. 6 and for the show at the Coliseum in Chicago beginning Jan. 20 was taken.

**SUPPLY OF STEEL SCARCE.**

The supply of soft steel bars largely used in the motor industry is not equal to the demand. There is a demand for more than 50,000 tons of this material in Detroit alone and the buyers are having difficulty in getting their orders accepted. A number of very large contracts are waiting.

**SPENT \$282,000,000 FOR GOOD ROADS IN 1916.**

The Office of Public Roads and Rural Engineering of the United States Department of Agriculture has published statistics for the calendar year 1915, covering the expenditures for roads and bridges and the growth and maintenance of the same under state supervision.

On Jan. 1, 1916, the total length of public roads in the United States, outside of the limits of incorporated towns and cities, was about 2,452,000 miles, of which 277,000 miles, or 11.3 per cent. were improved with some form of surfacing. During the past 12 years the mileage of surfaced roads has been increasing at the rate of about 16,000 miles a year.

Since 1904, when the annual expenditure for road and bridge work was \$80,000,000, the amount has increased to \$282,000,000, which sum was expended last year. During the same period the expenditure of state funds increased from about \$2,550,000 to more than \$53,000,000. In addition to this amount more than \$27,000,000 of local funds was spent under state supervision in 1915, bringing the total road and bridge expenditures managed by the states to \$80,514,699.

**MOTOR AND ACCESSORY SPACE ALLOTTED.**

The space for motor and accessory manufacturers at the New York and Chicago national automobile shows was allotted at a recent meeting of the allotment committee of the Motor and Accessory Manufacturers. Space was allotted to 115 association members, which is the largest number that ever drew for space for any show. Of those who drew for space at the shows 87 will exhibit at both New York and Chicago, 16 will be represented at the New York show and 12 will be at the Chicago show only.

**BIG BOWER DIVIDENDS.**

The Bower Roller Bearing Company, Detroit, has declared its third quarterly cash dividend of 15 per cent., making 45 per cent. paid in cash dividends so far this year. The directors of the company have also recommended that the stockholders of the company authorize a stock dividend of 100 per cent. at the annual meeting of the company in January.

**BIG ORDER FOR CLYDE TRUCKS.**

The Clyde Motor Truck Company, which is putting up a plant at Amityville, N. Y., has received an order for 204 trucks for export at a price of \$1000 each. The company will manufacture one type of chassis having one ton capacity.

In reports to the New York Stock Exchange the White Motor Company and subsidiary companies show total net assets of \$19,541,710. This report was of June 30, 1916, at which time the company had \$2,022,337 cash on hand.

**VERDICT FOR \$1700 FOR LOSS OF TIME BY TRUCK.**

Patrick J. Flaherty of Portland, Me., obtained a verdict of \$1700 against the Maine Motor Car Company of that city in a suit for \$5000 which he brought against the defendant, claiming that the truck sold him did not meet specifications and that he suffered losses in his business on account of the time spent in having the machine repaired. He also claimed that the defendant had broken the contract made with him when the car was purchased.

The Maine Motor Car Company in defending the suit had filed an account in off-set for storage and repairs amounting to about \$400.

**MOLINE PLOW PROFITS.**

The Moline Plow Company, Moline, Ill., manufacturer of the Moline-Universal tractor, made net profits of \$1,034,552 for the fiscal year ending July 31. The surplus at the end of the year was \$1,114,245, as compared with \$604,693 the year previous.

According to a statement of President Stephens, owing to the falling off in the demand for buggies due to the fact that in the southern states there is a pronounced tendency to substitute automobiles for horse drawn vehicles, the company has made provision to convert one of its buggy factories at Freeport for the production of automobiles. He also stated that the prospects for the coming year were better than they had been for two years.

**BUCKWALTER WITH TIMKEN.**

T. V. Buckwalter, formerly of the engineering department of the Pennsylvania Railroad Company at Altoona, Penn., has been appointed chief engineer of the Timken Roller Bearing Company of Canton, O.

While with the Pennsylvania company Mr. Buckwalter was in charge of the self-propelled vehicle research work in connection with the development in motor car practise.

**CLIMBED 55 PER CENT. GRADE.**

A 2½-ton Larabee-Deyo truck made a new record for grade climbing at the New York state fair at Syracuse, ascending a 55 per cent. gradient, which is within a few degrees of the angle where gravity would overcome traction. A special incline was erected on which the truck made the demonstration three different times.

**TO BUILD TRUCKS IN AUBURN.**

A new motor truck company is being organized to engage in the manufacture of motor trucks at Auburn, Ind. The company has been formed, but as yet no details have been given out. It is understood that the parties interested are all of Indiana, including Indianapolis, Fort Wayne and Auburn business men.



## THE DENMO MODEL 10, 2500-POUND TRUCK.

ONE TYPE of vehicle, that is known as model 10, is now being produced commercially by the Denneen Motor Company, Cleveland, O., which has given the name of Denmo to its machines. The model 10 is designed for maximum load of 2500 pounds and is rated at  $1\frac{1}{4}$  tons. The price of the chassis, completely equipped, f. o. b. Cleveland, O., is \$1385. While no types of bodies are standardized as company production, any equipment can be built to specification and installed at the works before shipment if the purchaser so desires.

The Denmo truck is conventional in every respect, it conforming to what may be regarded as standard motor vehicle practise, and from one point of view is conservative construction, but from another it may be said to be to engineering that has been proven the world over and can be accepted without question by those who desire vehicles that can be depended upon

tire pump, tire repair kit, tool kit and jack.

The wheelbase is 124 inches and the tread standard. The chassis can be turned in a 21-foot radius. There is 108 inches of loading space back of the driver's seat and the frame extends but 16 inches beyond the rear ends of the springs. The weight of the chassis is 3050 pounds, which is extremely light when the capacity is considered.

### Engine a Special Wisconsin.

The engine is a special design and is a four-cylinder, four-cycle, water cooled, L head type, with the cylinders cast en bloc from a superior quality of gray iron with the water jackets integral. The cylinder bore is  $3\frac{3}{4}$  inches and the stroke five inches, and is rated by the S. A. E. formula at 22.5 horsepower, but, as the maker claims, will develop 35 horsepower. The cylinder block is cast with the water jacket head open, this being closed by a large cover plate having a longitudinal channel to insure a full flow of the water. The plate is retained by a series of cap screws. Great care is taken in boring and finishing the cylinders. The pistons are cast of the same quality of metal and are turned and ground to size and are exactly balanced.

The crank case is in two section of aluminum alloy. The upper section is made with a heavy transverse vertical web that carries the centre main bearing. The lower section contains the oil reservoir. By removing the main and connecting rod bolts the section may be removed for work or



The Completely Equipped Chassis of the Denmo Model 10 as Delivered to the Purchaser Ready for Body Installation.

for satisfactory service. The units in the truck are the products of manufacturers who are well and favorably known, and which can be depended upon for economy and efficiency if given the degree of attention that might ordinarily be expected in average working conditions.

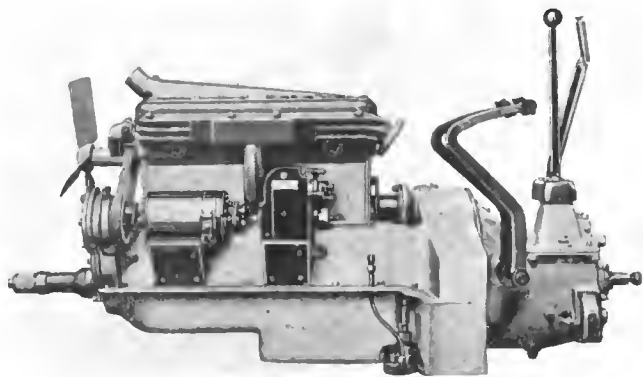
### Standard Units and Equipment.

The chassis includes a unit power plant made up of a Wisconsin engine and a Borg & Beck dry plate clutch, Torbensen drive—internal gear—rear axle, Lavine steering gear, Fedders radiator, Dixie magneto, Stewart carburetor, Pierce governor and Stewart speedometer and a Splitdorf-Apple two-unit lighting and starting system. The chassis equipment is exceptionally complete, including windshield, electric dash, tail and spot lights, bumper, spare rim, license brackets, motometer, speedometer, besides the driver's seat, dash and instrument board, fenders, running boards,

inspection. The crankshaft is chrome nickel steel that is heat treated and has a tensile strength of 120,000 pounds to the square inch, with the flywheel flange forged integral with it. It is ground to size and carefully balanced. The main bearings are  $1\frac{3}{4}$  inches diameter and are  $2\frac{3}{4}$ ,  $2\frac{3}{4}$  and four inches length from front to rear. The crank pins are  $2\frac{3}{4}$  inches length.

### Some General Engine Details.

The crankshaft is carried in high grade babbitt metal bearings mounted in bronze cages, and the connecting rod bearings are of the same material, these being grooved to insure thorough lubrication. The camshaft is a fine quality steel with the cams integral, that is carefully machined, hardened and ground. This is mounted in phosphor bronze bearings that are grooved and have oil pockets to insure lubrication. The connecting rods are drop forged I section, that are perfectly balanced. They are fitted with babbitt bear-



Valve Side of the Special 25 Horsepower Wisconsin Engine and Power Plant of Denmo Trucks.

ings in bronze cages at the big ends. The wristpins are made of steel tube, hardened and ground, that is keyed in the connecting rod end with a bolt. The pins oscillate in bronze bushed bosses in the pistons.

The valves are large, the inlet valves being of special steel and the exhaust valves of tungsten steel. They operate in long guides. The valve tappets are a mushroom type that are mounted in guides and are fitted with adjusting screws and lock nuts. The valve mechanism is enclosed by steel cover plates that are retained by winged nuts. The timing gears are large and wide faced and are helical cut to obtain noiseless operation.

#### Cooling and Lubricating Systems.

The engine is cooled by thermo-syphon circulation of water through the cylinder jackets and a Fedders cellular radiator that has a very large cooling area. Radiation is promoted by a fan carried on annular ball bearings on an adjustable bracket that is driven by a flat belt from a pulley on the magneto shaft. The radiator is mounted on a steel plate that extends the full length of the base and is supported at either end on springs, so that it is protected against stresses and it cannot sag from road shock.

The lubricating system of the engine includes a pump driven by spiral gears from the camshaft that forces the lubricant through a duct cast integral with the crank case and thence through ducts in the main bearing webs to the main bearings; thence through the hollow crankshaft to the connecting rod big ends. A sufficient volume of oil is thrown off by the connecting rods to thoroughly lubricate the cylinders, pistons, camshaft and valve tappets. The timing gears are lubricated by the overflow from the front main bearing. The excess oil drains to the reservoir and is filtered before it is again circulated.

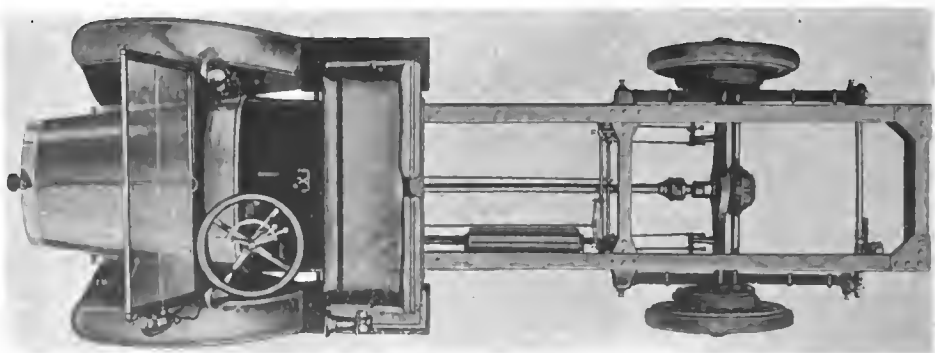
The ignition current is supplied by a model 44 Dixie magneto and the fuel is carbureted by a Stewart carburetor that is fitted with a stove from the ex-

haust manifold to promote complete vaporization.

The clutch is a Borg & Beck single dry plate type that is constructed so that there will be positive lubrication of the clutch release. The transmission gear-set is a selective sliding gear type, having three forward speed ratios and reverse. The gears and shafts are made from nickel steel and the shafts are mounted on annular ball bearings of large size. The power is transmitted through a single shaft with a universal joint at either end to the pinion shaft of the Torbensen drive—internal gear—rear axle. In this construction the lead is carried on the I section axle and the drive is through the jackshaft bolted to the rear of the axle and spur pinions to the internal gears enclosed in the brake drums on the rear wheels. The gears, pinions and shafts are nickel steel or chrome nickel steel, and the internal gears are special steel, all heat treated. The mechanism is completely enclosed and fully protected.

The front axle is an I section steel drop forging. The frame is a steel channel section 3/16 inch thick, five inches deep, having webs from two to four inches width, that is suspended on semi-elliptic springs, the master leaves of which are heat treated vanadium steel. The front set is 42 inches length and 2 1/4 inches wide and the rear set 50 inches length and 2 1/2 inches wide. The spring eyes are bronze bushed and the spring bolts ground and hardened. The front wheels are equipped with either 34 by 4 1/2 inch pneumatic tires on Goodrich steel felloes, or with solid 34 by 3 1/2-inch tires. On the rear wheels 34 by four-inch solid tires are installed. The pneumatic tires are fitted with demountable rims. The wheels are artillery type.

The steering gear is a Levine construction, worm and nut type, with a very heavy drag link, and is installed at the left side. The brakes are internal expanding and external contracting, the latter the service brake, this being provided with adjustment and is equalized. The internal brake is operated by a cam action. The brake drums are 15 inches diameter and the faces are two inches wide. The control is by the usual foot pedals for clutch and service brake and with centre levers for the emergency brake and gear shifting. On the steering wheel are the ignition and throttle levers.



Top View of the Denmo Model 10 Chassis, Showing the Driving System and the Torbensen Drive—Internal Gear—Rear Axle.

### PIERCE-ARROW TRUCK CUTS HAULAGE COSTS.

A five-ton Pierce-Arrow truck in the service of the American Woolen Company and operated between Lowell and Collinsville, Mass., cut the haulage costs 50 per cent. as compared with the expense of operating 12 two-horse teams which had formerly been used to do the same work.

The haulage consists of bringing raw material to the plant and taking away the finished product for shipment. The cost was 70 cents a ton by horse drawn wagons, while the present cost of using the truck is from 28 cents to 40 cents a ton, the maximum figures being reached when extra outlay is made necessary for repair or new tires. The average costs by truck per ton are 34 cents, not including charges for depreciation, insurance or interest, as against 70 cents with horse drawn teams, not including charges for depreciation, insurance or interest. Figuring depreciation, interest and insurance on the truck, however, and not on the horse teams, the truck is still much more economical, the total cost for hauling a ton figuring only 58 cents against 70 cents.

### WOULD LIMIT TRAILERS.

A new traffic law regulating the use of trailers will come before the city council of Cleveland, O., at the next meeting. If adopted in its present form it will prohibit the use of more than two trailers per truck or car and requires that an extra man be employed to ride with the driver when the trailers are used if they contain more than 500 pounds. This extra man will also be required to ride in the trailer whenever a grade of more than five per cent. is being ascended. The ordinance will also compel trailer owners to equip these units with suitable brakes or safety chains. The use on the streets of the city of trailers with steel tires carrying weights of over 750 pounds will also be prohibited in the event the law becomes effective.

### SELLING AND DELIVERING.

F. B. Holmes of the Kissel Motor Car Company, Hartford, Wis., says that the pace of a merchant's business is set by the delivery system.

"A certain merchant's profits were doubled the first year after he discarded horses," says Mr. Holmes, "and he explained that the reason was not only the better facilities for serving his customers, but the feeling created among the clerks that they must keep the truck busy."

### TEST PIPES WITH TRACTOR.

In West Chester, Penn., the authorities used a traction engine to test new steam street mains. The machine was run over the filling over the pipes for two days before they were covered with paving to save trouble in case there was any weakness as in the joints or parts.

### S. A. E. AUTO NOMENCLATURE.

The Nomenclature Division of the Standards Committee of the Society of Automobile Engineers has practically completed its work of standardizing the names of car parts and items of terminology and a pamphlet containing a list of over 600 names has been sent out to the members.

The purpose of this standardization of names of automobile parts was to establish within the automobile field a precise and compact language which would greatly facilitate ordering parts and defining construction work and incidentally eliminate much of the confusion arising from the fact that heretofore different names were commonly used to designate the same parts.

This list, which is now recommended by the S. A. E. for adoption by the automobile manufacturers and trade in general, was developed through the combined efforts of engineering and service representatives from a number of the leading automobile manufacturing organizations.

As a rule the nomenclature as fixed does not show many unusual changes, although one notable exception is in the case of the term "motor," for which is substituted "engine," to avoid confusion with electric motors used in starting the engine.

The S. A. E. has also adopted a number of other important standards, including new specifications for nickel steel, physical properties of nickel and nickel chromium steels, complete dimensions and tolerances for roller bearings, throttle lever throw dimensions for carburetors, gearshift positions for three-speed transmissions and dimensions for piston springs of both concentric and eccentric types.

### SEWELL ON EASTERN TRIP.

Walter T. Sewell, sales manager of the Sewell Cushion Wheel Company, Detroit, Mich., is on an extended trip through the eastern part of the country, visiting branches to discuss plans for the coming year. His itinerary will include stops in Baltimore, Philadelphia, New York and Boston.

### KILLING TWO BIRDS.

The International Harvester Company is equipping an International Model H truck with an electric lighting and heating plant, which is designed specially for country homes. This outfit will be used in the territory around St. Joseph, Mo., for demonstrating the lighting outfit as well as the truck.

### ELECTRICS IN EXPRESS WORK.

The American Express Company, which for years has used electric vehicles extensively in the service at its different branches, recently purchased a large number of these machines and now has 560 electrics in 10 different cities.

### CUSTOMERS' LOSSES FROM FAULTY GASOLINE PUMPS.

The Bureau of Standards of the United States Department of Commerce, in a report entitled "Technology Paper No. 81," pertaining to the accuracy of liquid measuring pumps, gives a number of causes why this type of apparatus is responsible for the gasoline customer receiving short measure in any instances. It also states that figures based on the best estimate obtainable show that in the State of Illinois alone the losses to the people of the commonwealth due to short measure in gasoline are not less than \$530,000 a year.

"Of various measuring systems of different types chosen at random and tested by the bureau of standards' inspector, in a number of different cities, from 70 to 80 per cent. had excessive errors," the report says.

It is further stated that:

"The principal causes of short delivery are leaks in valves or piping; formation of vapor due to excessive suction lift, or the introduction of air under the piston; failure to correct for the inertia of a long column of moving liquid; the use of long filling hoses with a low connection at the pump, making proper draining of hose an impossibility; "short stroking" or operation of pump at less than full stroke (usually deliberate), and slippage past valves and piston."

### WILL VOTE ON ROADS BILL.

The voters of New Jersey on election day will vote on a referendum question for the adoption or rejection of the provisions of the Egan bill, creating a highway commission and providing for a \$7,000,000 bond issue for the improvement of the 13 main highways in the state.

The bill provides that these main routes "shall be paved with granite, asphalt or wood blocks, brick, cement, bituminous concrete, asphalt or other pavement having a hard surface and of a durable character."

### SHELDON INSTRUCTION BOOK.

The Sheldon Axle and Spring Company, Wilkes-Barre, Penn., has issued a book of instructions for the care and adjustment of Sheldon worm driven axles. The book contains clearly and carefully written instructions how to maintain the axles and springs in a state of continuous efficiency and there are sketches that illustrate every operation that is dealt with in the text. The book is valuable to every owner of vehicles in which Sheldon units are used.

### BIG CAMPAIGN FOR ROADS.

A good roads committee of 100 is conducting a campaign in California for a \$15,000,000 bond issue for highway improvement that is to be voted on at the general election in that state in November.

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# The MOTOR TRUCK

*Devoted to Motor Driven Business  
Vehicles of all Classes*

Pawtucket, R.I.

Vol. VII. No. 11. NOVEMBER, 1916.

## TIME ECONOMY OF INTERCHANGEABLE BODIES.

**Liggett Company Reduces Idle Period at Warehouse at New York from Three Hours to Three Minutes—Makes Distribution to 58 Metropolitan District Stores by Truck—Long-Distance Trailer Delivery a Great Saving.**

**E**QUIPPING truck chassis with removable bodies has resulted in a remarkable economy in the transportation expense of the Louis K. Liggett Company, which operates the largest chain of drug stores in America. The saving cannot be measured by work or service with other vehicles, because the company began to use its equipment a short time after the consolidation of the Riker-Jaynes and Riker-

Hegeman Corporation was at 340 West 4th street, New York, N. Y., from which all of the company's stores were supplied. With the change to New York City the warehouse in that city was made the principal source of supply and the Boston warehouse was used incidentally. The laboratory, where many of the company's own products were produced, was removed from Boston to the New York warehouse.



**Fleet of Packard Trucks Used by Liggett Company to Distribute Stock from New York City Warehouse to 58 Stores, and to Shipping Terminals for 100 Others, with the Interchangeable Body Equipment.**

Hegeman corporations with the Liggett company and the removal of the executive offices of the Liggett company from Boston to New York City.

The merger took place last February and immediately the company began to systematize and departmentize. At that time the Liggett company maintained a warehouse in Boston, from which stock was shipped to all its stores. The warehouse of the Riker-

The New York City warehouse is a nine-story structure, the first floor of which is the shipping department. On the second floor are the offices, and on the floors above are the stock rooms and laboratory. Besides this the company utilizes two floors of an adjacent building for storage.

### **Company Operates 150 Stores.**

The Liggett company operates about 150 stores in



cities between Boston and Detroit, and as far south as Philadelphia. The policy is to supply all of these stores from the New York warehouse, so that all of the stock is first received at or produced at New York and from that city shipped to each store. System demands this as being more economical than were each store to buy independently, and while there may appear to be considerable additional handling and transportation in distributing from a common or general stock, experience has proven that it is best in serving chains of stores that have widely varying requirements.

The Riker-Hegeman corporation operated practically in New York City prior to the merger and the warehouse that is now used was leased. The lease was taken over when the Liggett company assumed control. When decision was reached to supply all stores from New York and establish the laboratory

the warehouse, transferring its officers from Boston. Distribution of stock was carefully studied. At that time the Liggett company operated from its Boston warehouse one four-ton Packard truck, and one three-ton and one two-ton trucks of other makes. The Riker-Hegeman company distributed with a five-ton Packard truck and two small machines of 1000-pound capacity, and with 14 two-horse trucks, and it occasionally used additional animal trucks. The company desired to simplify stock distribution so far as possible and required all store managers to maintain a standard established for them. Each makes a weekly requisition for stock replenishment on a specific day of the week and this is received at the warehouse and the order is filled and shipped always on a regular shipping day.

This means that each of the 150 or more stores receives once a week a considerable volume of stock.

Unless there is some excellent reason no shipments are made between the regular dates, and as the shipping days are fixed with reference to the facilities at the warehouse and the purpose of equalizing the work there so far as is possible, one may assume that each day there is approximately the same volume of stock sent out. There are two ways of shipping. The orders are collected from stock and packed in the shipping room. Those for the stores outside of the Metropolitan district are delivered to the different freight and express terminals, the packages being made as large as is convenient to handle because of the desirability of minimizing the shipment units.

The orders for the stores in the Metropolitan district are delivered direct from the warehouse. and when these data for this article were obtained shipping department was making delivery direct from the warehouse to 44 stores in New York City (Manhattan and the Bronx), seven in Brooklyn and one each in Newark, Jersey City, Paterson, Yonkers, White Plains, Mount Vernon and New Rochelle, or 58 in all. With the discontinuance of the Boston warehouse and the transfer of stock to New York the two Packard trucks were retained, but the other machines were disposed of. The horses were not economical because only a part of the stores could be served with them. The one idea was to develop an organization and a system that would be economical with trucks.

The warehouse has two internal loading platforms, or bays, both directly connecting with the shipping



**Loading Three of the Bays in the Loading Bay at the Liggett Warehouse, 12th Street, New York City, While the Trucks Are Making Regular Trips.**

there, this was based on the fact that approximately a third of the stores were then within what is known as the Metropolitan district, or within less than 25 miles of the New York City hall. Not only this, there is assumed to be better transportation facilities in New York than in any other city in America. Statement may be interpolated that the company's policy was to operate only those stores that were found to be productive after the consolidation and some have been discontinued and new stores have been established, but the number in New York and vicinity has been increased and the purpose is to add to this number as conditions justify, so the reader will understand why the location of the warehouse and its facilities are very important.

The Liggett company located its executive office in

room, the one entered from 12th and the other from 13th street. These are large enough for four horses or motor trucks to be backed to the doors of the shipping room, and the floor is level with the average truck deck, so that loading may be done with hand trucks. The warehouse has large elevators, but the packages and boxes, unless of considerable size, are sent from the stock rooms on lowervators—broad skeleton shelves carried by endless chains on which the goods are sent down and automatically shunted into chutes that distribute them by gravity on the shipping room floor—this eliminating one handling and insuring against congestion or delay.

#### How Time Was Lost With Horses.

The stock for each shipment is collected as sent from the rooms above and piled on the floor. Because of the large number of items in the average order and the necessity of packing them in the stock rooms, a good deal of time was lost, and the average time of loading a truck was from two to three hours. Possibly  $2\frac{1}{2}$  hours might fairly represent a loading period. The idle time of the trucks was so large and the actual service or working time so much reduced that not only was the delivery distances shortened, but practically double the number of vehicles was required. With the operating expense of power trucks much greater than animal trucks, the need of keeping them moving was evident.

The Liggett system includes an expense division, the executive of which is responsible for every expenditure made for the company, and the heads of this and the transportation department carefully studied the conditions with a view to utilizing trucks and dispensing with horses and making all deliveries in the Metropolitan district with machines. After investigation of the shipping room and vehicle equipment of several concerns a plan was decided. This in brief comprehended the use of five Packard trucks, three of which were immediately purchased. This gave the company one five-ton truck and four four-ton machines. For the five-ton and three four-ton chassis eight bodies were built, these consisting of platforms heavily braced and reinforced, with crate sides and forward ends and removable skeleton tail gates for use if necessary. The sides and ends are high, so that bulky loads may be carried and covered with tarpau-

lins in the event of storm. Under the platform on either side at the front and rear of the body are two heavy steel brackets that are so located as to seat ahead of a frame cross member when the body is in place, and when the body is elevated four inches or thereabouts the chassis may be driven from under it.

#### Loaded Bodies Always Ready.

The weight of the bodies is about the same as those that would be permanently installed on truck chassis of the same sizes, but the frame and platform is more substantial than if they were to be mounted on bolsters. In each of the loading bays a series of four overhead hoists were installed, these being standard equipment, each hoist consisting of shafts and gearing so interlocked that it may be operated by overrunning a chain, the power being so compounded that one man



One Man Lowering a Loaded Body on a Truck Chassis—The Exchange of Bodies Can Ordinarily Be Made in Three Minutes.

can raise or lower a body fully loaded. The hoist has four chains that are hooked into eyebolts at the corners of the platform. Each hoist is independent of the others.

The method of using these bodies is to have four suspended on the hoists at all times, and the loads are made up for these as rapidly as is possible, the time allowance for loading depending upon the work of the chassis. As the trucks reach the warehouse they are backed under the hoists in the loading bays and the empty bodies raised. They are then backed under loaded bodies, which are lowered, and the machines can be sent away with an average of three minutes stop. Every afternoon the four bodies available are loaded and in the morning the trucks are driven to the warehouse at 8 o'clock. Three minutes later they are

driven away loaded and four empty bodies are ready to be loaded.

#### **Routing According to Orders.**

The order schedule of the stores is made up so that routing is possible—that is, more than one delivery can be made to a trip, and in some instances one truck will carry out the orders for several stores. While the volume of stock ordered will depend upon the business transacted there is not much variance in them and so the machines can be loaded to capacity with rare exceptions. The conditions for delivery at the stores are not ideal by any means, but the unloading can be done much more quickly than the loading, and the drivers and helpers work fast and lose comparatively little time. Usually each truck can make several trips a day to the Metropolitan district stores, and in addition there is regular haulage to be done daily to and from the freight houses and piers, for there are freight and express shipments to nearly 100 stores outside the district. Occasionally horses are used when extra transfer work is necessary, and sometimes horse trucks are hired for a day if there is unusually heavy delivery to be made, but ordinarily the four trucks are equal to the warehouse distribution requirements. Of course the routes vary in length, but the work is equalized so that each truck handles about the same tonnage and the mileage is very close. The machines are driven an average of about 55 miles a day.

#### **Long Distance Delivery by Trailer.**

The Liggett company operates five stores in Philadelphia and vicinity, one of which is at Germantown and another at East Liberty. The supplies for these are shipped by freight and express on given days, the orders being received and handled as has been stated. With a view of determining the possibilities of economizing by sending the freight and express by truck over the road a series of experimental shipments were made. Three Troy trailers, each having capacity of five tons and equipped with tarpaulin covered tops, were purchased. The five-ton truck was selected for the work as it has the greatest load capacity. With the truck carrying five tons of freight and hauling a trailer with a similar load, the round trip of 225 miles between the warehouse and the Philadelphia stores has been made in two days, the outward run and the delivery being made in one day and the return trip in another.

The trip being straightaway and without stops, comparatively fast time can be made each way, and the crew does not work longer than when making regular routes from the warehouse. Besides saving three handlings, with lessened damage from breakage, practically two days' time are gained and there is an actual saving of from \$150 to \$200 a trip.

A similar experiment was made with the orders for the company's stores at Stamford and New Haven, Conn., which are respectively 37 and 77 miles distant from the warehouse. The round trip has a mileage of approximately 200. Leaving New York with a trailer

and a 10-ton load the truck was driven first to Stamford, where the trailer was left at the store for unloading, the machine continuing on to New Haven, when its load was delivered. The delivery at New Haven was completed at 6:30 and then the truck returned to Stamford, where it and the trailer were garaged. The next morning the truck was driven back to New York, arriving there in season to do a half-day route. The net result was the saving of a day's time in delivery and rather more than \$100 and the stock was delivered in better condition than had it been sent by freight or express. The possibilities of this method of delivery are so large that it will no doubt eventually be adopted for the regular distribution.

#### **Distribution of Ice Cream by Truck.**

Ice cream is served at all of the stores and the consumption varies with the seasons, but it is a stock that is in constant demand. The company has an ice cream manufactory from which deliveries were first made by two two-horse trucks, the cream being packed in five-gallon containers that were in tubs filled with ice and salted to promote frigidity. The filled tubs and cans were delivered at the stores and empty tubs and cans returned to the factory. Because of the weight and the shape of the tubs, but a few could be carried at a load. Loading and unloading was not a matter of great importance, but there were decided limitations to the work that could be done. In extremely warm weather, when the demand was greatest, the delivery was extremely urgent and the capacity of the animals was least without the use of additional vehicles.

One of the four-ton Packard trucks was equipped with a special body for ice cream delivery, this being constructed so that the load can be removed at the rear and sides. The bottom of the body and the sides were covered with sheet copper to a height of eight inches. Into this in two tiers 130 cans of cream were packed, each can containing five gallons, and under, around and above them two tons of cracked ice. The loading could be done at the factory very quickly, as the cans and ice were always ready for packing, and in making the delivery the driver and helper had the cans and not the tubs, cans and ice to handle, so that time was saved at each stop. With this truck 1800 gallons of ice cream could be delivered to 30 stores when occasion demanded and by working overtime this could be considerably increased. The delivery was extended materially as compared with the team haulage, and there was a decided saving when the company used its own product instead of that of an ice cream manufacturer, and in the event of an emergency need not depend on other for its supply. The ice cream delivery worked out so successfully that the company's plan now is to establish a factory which will produce for all the stores, and the truck equipment will be increased so as to make regular delivery to them. During the period of the year when the demand is smallest the trucks may be used for other purposes, or, if need be, laid up until they are needed.

### Saving a Very Large Sum.

Because so much work is now done by trucks that was done by others for contract, or shipped by freight or express, and because of the fact that the company inaugurated its present service as early as possible after the merger, no very accurate measure of saving can be stated. But representatives of the company maintain that the entire cost of the trucks, bodies and special equipment for operating them will be paid for by the lessened expense of distribution within a year, and that there is every reason to believe that with the expansion of the delivery zone to include Philadelphia, Stamford, New Haven and probably other cities that can be readily served by trucks, and supplying ice cream to approximately 60 stores from the company's plant, the economy will total many thousands of dollars annually.

There is, as will be noted, nothing radical in the uses made of motor trucks, but the conditions have been carefully studied and the facilities and methods adapted so that there would be no loss of time of the machines. The trucks are well cared for. The drivers are enthusiastic and interested men, who are well paid. Each man cares for his machine so far as is possible for him to do so, and every week he has a half day to work on it. The major repairs are made at the Packard service station. The trucks are kept in public garages, but the purpose is later on to establish a company garage which will have every facility for maintenance and repair. Besides the attention given by the drivers there are monthly inspections by Packard service men. Because of the attention the repair expense is minimized. The trucks are not overloaded, and excellent tire mileage is obtained. The results may be judged from the fact that when these data for this article were obtained the forward set of tires on the five-ton truck had been driven 21,000 miles, and appeared to be good for several thousand more.

### LARGE PEERLESS EARNINGS.

The Peerless Truck and Motor Corporation, for the nine months ending Sept. 30, 1916, made net profits of \$1,932,259, which is equal to about 25 per cent. on the \$10,000,000 outstanding capital stock.

The net sales during the period were \$10,149,300. The sum of \$218,200 was charged off against depreciation and \$44,000 was debited to what the company terms extraordinary charges: \$184,500 was reserved for contingencies and \$44,000 was paid out in interest.

The current assets as of Sept. 30 were \$7,713,700, as against current liabilities of \$1,787,600. Its total special reserve for contingencies on Sept. 30 was \$784,500, and the funded total debt on that date consisted of \$5,000,000 Peerless truck convertible notes and \$290,000 in the form of a mortgage on New York real estate. Land, plants and equipment, less depreciation, are listed at \$4,778,900; patents and good will, including cost of acquiring subsidiaries which are listed at \$3,710,500, bring the total assets up to \$16,599,200.

### MADE BIG TRAILER EXHIBIT.

The Los Angeles Trailer Company, which has a factory in Los Angeles, Cal., exhibited its vehicles at the auto and truck show in that city and the display proved one of the features of the exhibition. Business men and manufacturers showed a keen interest in the trailers and the possibilities from their use in delivery and haulage work.

### COMMERCE TRUCKS FOR ENGLAND.

A considerable part of the production of the Commerce Truck Car Company, Detroit, Mich., has been exported, and these exportations have been in the main to European countries. The accompanying illustration shows an accumulation of machines in the factory yard preparatory to shipping them to New



Trucks Assembled in the Yard of the Commerce Motor Car Company, Detroit, Mich., to Be Shipped to the English Agents for Equipment with Bodies and Distribution in Continental Europe for Army Service.

York City, whence they were transshipped to England to the English agents of the company. On arrival in London the machines will be equipped with special bodies, after which they will be again shipped to different points in Continental Europe for army transport service. Several shipments have been made previously, so that Commerce trucks are well known abroad.

### THE LYONS FAIR IN FRANCE.

The Merchants' Association of New York City, with offices in the Woolworth building, will furnish a booklet describing the Lyons fair to any person who applies for one. The Lyons fair is a commercial exposition which will be held at Lyons, France, during the fortnight of March 1-15, 1917.

## ELLSWORTH 1000-POUND DELIVERY WAGON.

**S**PECIALIZING a single type chassis that has a load capacity of 1000 pounds, and which is sold with express body equipment for \$695, the Mills-Ellsworth Company, Keokuk, Ia., a long established and

the crank case. The lower section of the crank case is pressed steel, which is strong and light, and it serves as the oil reservoir. The engine is cooled by a thermosyphon circulation of water through the cylinder jackets and a square tube sheet metal cased radiator of large capacity, radiation being promoted by a fan mounted on an adjustable bracket and driven by a flat belt from a pulley on the generator shaft. The radiator is a Candler construction. This is mounted at the front end of the chassis and is well protected against chassis stresses.

The engine is lubricated by a combination circulating splash system that is said to be extremely efficient and economical of lubricant. The ignition system is single and the source of current is a magneto, the variance being ob-

tained by movement of a hand lever. The carburetor is an automatic float feed type and the fuel is supplied by gravity. The gasoline tank holds 10 gallons and is located under the seat.

The clutch is a cone type, 12 inches diameter, with six engaging springs, and the transmission gearset is a selective sliding gear construction, having three forward speed ratios and reverse. The direct gear ratio is 4.46:1. The drive is through a single shaft of chrome nickel steel, having one universal joint and



Ellsworth Model 25-A Chassis Equipped with a Stake Platform Body and Driver's Cab—This is a Standard Type.

well known concern, has identified itself with the motor truck industry. The policy of the company is to build a standardized design, that is conventional from every point of view, and which includes units produced by manufacturers of reputation.

The machine is known as the Ellsworth, model 25-A, and it is designed for the use of a very large class of business men who require fast, light delivery in a zone of considerable area. The wheelbase is 108 inches and the tread 56 inches, and the chassis with express body weighs 2200 pounds. It is equipped with a single unit electric lighting, starting and ignition system, and is exceedingly complete.

The chassis is built with a unit power plant, the engine being a four-cycle, four-cylinder, water cooled, L head type, with the valves at the right side. The cylinder block is cast en bloc and the cylinders have a bore of  $3\frac{1}{4}$  inches and stroke of five inches. By S. A. E. formula the horsepower rating is 16.9, but as the bore to stroke ratio is 1:1.65, the claim by the manufacturer that the engine will develop 30 horsepower is conservative.

The Lycoming engine is substantially constructed, having a large two-bearing crankshaft, mounted in the upper section of



Express Body with Standing Top Equipment. Another of the Standard Type of Ellsworth Model 25-A Machines.



bevel gears to a full floating rear axle. The axle has nickel steel pinion and gears, annular differential and roller wheel bearings. The frame is constructed of pressed steel channel section of 5/32 inch metal and it is mounted on Sheldon springs, semi-elliptic, 36 by 1 1/4 inches forward and cantilever rear, 44 by two inches. The propulsive effort is through the rear springs and the driving torque is taken by a torsion tube.

The wheels are wood, artillery type, with 12 oval spokes each, and these are equipped with 30 by 3 1/2-inch pneumatic tires on demountable rims all around. The steering column is at the left side and the control is by clutch and service brake pedal in the footboard, by gear shifting and emergency brake levers in the centre, and by hand levers on the steering wheel that control the ignition and the fuel supply. Both sets of brakes are an internal expanding, operating within drums 10 inches diameter on the rear wheels. The brake shoes are 1 1/8 inches width. The electric starting-lighting-ignition system is an Apple, six-volt, with

preliminary to purchasing a motor truck for municipal work.

The officials were the salesman's guests at one of the local theatres, where he showed moving pictures of trucks made in actual service, as well as the different units used in its construction and various manufacturing processes. Later in the week the same pictures were shown to the public, flashed on a screen on one of the principal buildings, in the evening.

#### MAXWELL MOTOR CO. BUYS FEDERALS.

The Maxwell Motor Company, Detroit, Mich., recently purchased a fleet of six Federal trucks, which will be used in general haulage to and from the works in that city and the different piers and railroad terminals, as well as for miscellaneous service. This is claimed by the Federal Motor Truck Company to be the largest order ever given by one concern in the industry to another for trucks, and the sale was made through the Thompson Auto Company, the Detroit



Fleet of Federal Trucks Recently Purchased by the Maxwell Motor Company, Detroit, Mich., Said to Be the Largest Order Ever Given in the Industry by a Manufacturer.

large storage battery. The chassis is equipped with speedometer, windshield, horn, extra rim, head and tail lamps, tools, jack, tire repair kit, etc.

#### TEST FIRE PUMPS ON FORD.

Fire engine pumping apparatus, installed on a Ford chassis, was recently tested before the town officials at Upton, Mass., and the demonstration was thoroughly satisfactory. The little pump operated by the Ford engine, connected with 850 feet of hose, threw a stream through an inch nozzle, 50 feet over the town hall. Manouvering demonstrations were also made and the machine sent a stream of water over the steeple of the Upton Congregational church, which is 150 feet high.

#### MOVIES DEMONSTRATE TRUCK.

A truck salesman in Little Falls, N. Y., used a novel method to demonstrate the machines he sells to the officials of that city who are making investigations

agent for the manufacturer.

Statement is further made by the Federal company that more than 30 different manufacturers of cars and accessories are now using Federal machines, and that this make of truck predominates among automobile manufacturers aside from those who have affiliations with concerns that build trucks. Emphasis is also made that several truck builders sought to sell the Maxwell company, and the sale was made in active competition with the market.

#### SEDLEY WITH EISEMANN COMPANY.

Parke G. Sedley, formerly New York branch manager of the Heinze Electric Company of Lowell, Mass., has joined the sales organization of the Eisemann Magneto Company and will be stationed at the general office in Brooklyn, N. Y. During January he will go to Chicago, where he will have charge of the direct branch of the Eisemann Company.

## THE WATSON FIVE-TON WORM-DRIVEN TRACTOR.

**A**N EXPERIENCE of more than a quarter century constructing equipment designed especially for the use of contractors is represented in the Watson tractor, a haulage unit built by the Watson Wagon Company, Canastota, N. Y., which has capacity to haul semi-trailer loads of five tons in all work that is practically possible. The tractor is not unusual in design or appearance other than having a very short wheelbase, for the intention is to use it with semi-trailers, and turning in a small radius is a particularly desirable quality.

The company for 27 years has built the Watson wagons, which have two characteristics that are known the world over—the one being the discharge by gravity through the bottoms, which are retained by latches and released by hand levers, and the other is the "cutaway" construction of the body so that the wagons may be turned practically in their own lengths. These wagons are built to have numerous capacities and are very generally used by contractors, because loads can be discharged very quickly and wherever desired with minimum of movement, which is a factor of large importance when working on rough or soft ground.

### Built of Standard Units.

The tractor was developed with the purpose of using semi-trailers having the same qualities that make for economy in Watson wagons, with the expectation that some Watson wagons could be used for trailers and operated in trains, or the wagons could be replaced with larger haulage units of

trailer. Despite its power, it is seemingly small when dimensions are stated. The wheelbase is 80 inches and the tread is 61 inches forward and 64½ inches rear. Complete in every detail the tractor weighs 6250 pounds, and it is ordinarily geared to have 11 miles an hour maximum speed. The chassis is built of units that have been proven by service to be enduring, economical and efficient, so that there need be no concern as to the practicality of the machine.

The unit power plant consists of a Continental engine, Brown-Lipe multiple disc clutch and Brown-Lipe transmission gearset, and Sheldon springs, Timken worm shaft and worm gear rear axle, Timken front axle, Gemmer steering gear, Bosch ignition system, Zenith carburetor and Pierce engine governor are some of the principal components of the chassis.

### Model C Continental Engine.

The engine is a model C Continental, a four-cylinder, four-cycle, water cooled, L head type, having cylinder bore of 4½ inches and stroke of 5½ inches. This is rated at 32.4 horsepower by the S. A. E. formula and claim is made that it will develop 47 horsepower at 1500 revolutions. This is a standard production, the cylinder units being cast in pairs, with open water jacket heads that are closed with large plates that carry the water outlet manifolds. The crank case is cast aluminum in two sections, the upper having a vertical transverse web at the centre to carry the main bearing. The lower section forms the oil reservoir. The main and the connecting rod bearings may be reached for inspection or work by removing this section. Much care is taken in casting the cylinders to obtain uniform and free water passages, and the castings are thoroughly tested before and after machining to insure against possible defects. The pistons are fitted with four diagonally split eccentric rings and each has five oil grooves.

The crankshaft is a special steel drop forging, heat treated to have 90,000 pounds tensile strength, having three main bearings and is 1½ inches diameter. The flywheel flange is forged integral with the shaft, as are flanges at the centre bearing to take end thrust. The main bearings from front to rear are respectively three, 3 11/16 and 4½ inches length, a total of 11 3/16 inches. The connecting rod bearings are three inches length. The main and connecting rod bearings are high grade nickel babbitt. The connecting rod caps are retained by nickel steel bolts and the wristpins are clamped in the rod ends, the pins oscillating in phosphor bronze bushings in the piston bosses.

### Some Engine Details.

The camshaft is drop forged with the cams integral and it is mounted in white bronze bearings that are 2¼ inches diameter. From front to rear the bearings are 2½, 2¼ and 1¼ inches length. The timing gears are helical and operate almost noiselessly. The interchangeable valves are nickel steel heads electrically welded to carbon steel stems, and the pushrods are a mushroom type with adjusting screws and lock nuts. The valves are enclosed.

The engine is cooled by a circulation of water forced through the water jackets and a large honeycomb type radiator by a centrifugal pump. The radiator is mounted on springs to absorb the vibratory and distortion stresses. Radiation is promoted by a fan carried on ball bearings on an adjustable bracket and driven by a flat belt from a pulley on the pump shaft. The lubricant is drawn from the reservoir by a double plunger pump and forced through tube to the rear main bearings and the timing gears, and the centre main bearing, connecting rod bearings, camshaft, cylinders, piston, wristpins and tappets are lubricated by the splash of the connecting rod ends in the troughs into which they sweep and into which the oil flows. The excess drains to the reservoir. The ignition system consists of a Bosch DU4 high-tension



Watson Five-Ton Tractor and Watson Bottom Dumping Semi-Trailer of 120 Cubic Feet Capacity Making Turn at Right Angles, and in the Length of the Trailer.

generally similar construction. The machine is built of constructional units that are well known to the industry and will be recognized as the standard products of some of the largest and most successful specialists. These have been carefully chosen and the assembly has been with a view of obtaining extreme simplicity and accessibility, for the value of time economy and operating efficiency have been keenly realized.

In one respect the tractor differs with practically all others in that there is recognition of the fact that vibration, when the machine is not loaded, even when driven very slowly, is more destructive of metal than when loaded and driven to maximum speed. This destruction is due to the heavy springs, which do not absorb the vibratory stresses unless considerably deflected by loading. The entire power plant, the gasoline tanks and the driver's seat are mounted on a sub-frame that is suspended from the main frame at the forward end, and the rear end is carried on a pair of cantilever springs that extend to brackets on the rear axle. The rear springs of the tractor carry the forward end of the semi-trailer and 37 per cent. of the pay load—if this is equally distributed—but the light sub-frame springs, on which the only variable weight is the volume of fuel in the tank, effectually protect the engine from vibratory stresses and insure comfort to the driver. The latter result is incidental, but the former is extremely important.

### Five-Ton Load on Trailer.

The tractor has a load capacity with semi-trailer of five tons, but it will haul twice that tonnage with an additional

magneto and dry cells and Bosch vibrating duplex coil for starting. The carburetor is a standard Zenith model L.

#### The Power Transmission System.

The clutch is a multiple disc type, one side of each disc being faced with raybestos, which is enclosed in the flywheel housing and is operated without oil. The selective type sliding gear transmission gearset has four forward speed ratios and reverse. The shafts and gears are nickel steel, heat treated, the gears having  $1\frac{1}{2}$  inch faces and the shafts being mounted on Timken bearings. The drive is through a shaft and two universal joints to the Timken worm shaft and worm wheel rear axle. This is a full-floating construction, the worm shaft, differential gearset and wheels being mounted on Timken bearings. The front axle is a Timken I section nickel steel drop forging, the steering knuckle pivots and the wheel spindles having Timken bearings.

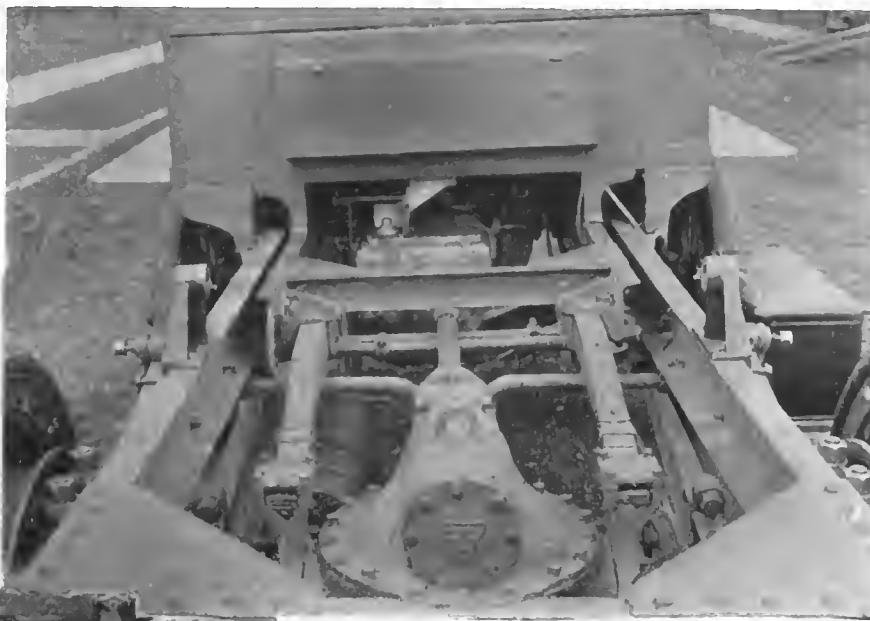
The main frame is constructed of six-inch channel section steel, heavily reinforced and braced. In this the sub-frame is pivoted forward. The frame is suspended on Sheldon semi-elliptic springs. The wheels are artillery type, of wood, each with 12 spokes,  $2\frac{1}{4}$  inch diameter in the front wheels and three inches diameter in the rear. These are fitted with 34 by four-inch solid tires forward and 36 by six-inch dual solid tires rear. The steering gear is at the right side, it being an irreversible worm and gear type, with a 22-inch hand wheel. The control is by the usual foot clutch and service brake pedals, with ignition and throttle levers on the steering column and the gear shifting and emergency brake

voted more than a year to perfecting the tractor after the design was determined, the purpose being to obtain what would be thoroughly practical from every operating viewpoint and could be guaranteed broadly as being equal to every requirement.

#### Some of the Haulage Tests.

During this period some extremely interesting tests were made, the tractor being operated with a five-ton Watson semi-trailer, this having 120 cubic feet capacity, of the regular bottom discharging type. One of these trials covered four days, during which time the tractor was driven 23 round trips, 13 of which were nine miles, eight 20 miles and two eight miles, a total of 293 miles. The total tonnage hauled was 289,700 pounds, or an average load of 12,597 pounds.

Work was begun about 7 o'clock and two days were short, the driver quitting at 4:30 and 3:15. The first day seven nine-mile trips were made with loads averaging 12,357 pounds and 16 gallons of gasoline were used, the average being 3.93 miles to the gallon. The second day six nine-mile trips were made with loads averaging 12,356 pounds and 17 gallons of gasoline were used, the average being 3.17 miles to the gal-



At Left, the Watson Five-Ton Tractor, Designed for Use in Small Space, Having Wheelbase of 80 Inches, Showing the Cab Over the Engine, the Dash Behind the Radiator and the Running Board Fenders; at Right the Rear End of the Sub-Frame Carrying the Power Plant and the Driver's Seat and Fuel Tanks, Mounted on Cantilever Springs Extending to the Rear Axle.

levers are at the centre. The service and emergency brakes are internal expanding in drums 18 inches diameter, the shoes being  $3\frac{1}{2}$  inches width. Each brake shoe has a surface area of approximately 195 square inches. There are two gasoline tanks, having a combined capacity of 25 gallons.

#### Some Features of the Chassis.

The tractor chassis is equipped with a metal dash with curved ends directly back of the radiator and there is a hood covering the engine back of the dash and ahead of the driver's seat. The seat is divided, there being an aisle between each section back to the trailer body. The driver's cab is built with a long bonnet, supported by two steel stanchions inside the dash and with extensions of the floor at either side the full length that serve as fenders, as well as running boards. The chassis frame side members are extended well ahead of the radiator and on these is fitted a heavy bumper. The chassis is sold with oil dash and tail lamps, hand Klaxon horn, complete tool kit and five-ton jack.

One will note that the tractor is equipped with very large brakes, either set being sufficient to hold the machine and a semi-trailer and trailer with 10-ton load on any grade that may be regarded as practical to work on. The company de-

lon. The third day two eight-mile trips and four 20-mile trips were made with loads averaging 12,700 pounds, 22 gallons gasoline being used, the average being 4.36 miles to the gallon. The fourth day four 20-mile trips were made with loads averaging 13,162½ pounds, and 18 gallons of gasoline were used, an average of 4.44 miles to the gallon.

During the four days one gallon of lubricant was put into the engine. The average gasoline consumption for the total period was very slightly in excess of four miles to the gallon. The average load, however, was 2597 pounds in excess of the five-ton rating of the equipment, or rather more than 25 per cent., and the average mileage was  $73\frac{1}{4}$  a day, although two of them were shortened. This tonnage and this mileage are in every way reasonable with quick loading and discharging, although the maximum speed of the tractor on the road is but 11 miles.

The possibilities of the tractor for any character of work are very evident from these figures. Having very short wheelbase, the machine can be handled in very limited space, where larger vehicles would be impracticable if not impossible, and with the bottom dumping trailer the loads can be discharged anywhere the outfit may be driven.

## SOME INDUSTRIAL ACTIVITIES.

### Endeavors by Varying Interests That Make for the Development of Business in Factories and Market.

#### OVERLAND 1200-POUND WAGON.

The Willys-Overland Company, Toledo, O., has announced a new 1200-pound delivery wagon which sells for \$775 completely equipped. The body is of pressed steel with a hard wood flooring, having 120 cubic feet of loading space. The use of two-inch metal flooring strips facilitates loading and unloading and also preserves the floor. The solid top with stake supports is equipped with storm curtains which protect both driver and merchandise.

The equipment includes an electric starting and lighting system and a high-tension magneto ignition system. The engine is a four-cylinder en bloc type, developing 35 horsepower. Other speci-

#### MODEL D MONARCH GOVERNOR.

The Monarch Governor Company, Detroit, Mich., is manufacturing a regulator for internal combustion engine speed that may be adapted to any construction, it being installed between the carburetor and the intake ports of the engine and is actuated by the velocity of the gas inhaled into the cylinders. Claim for superiority is made from the fact that there is a minimum of moving parts and no revolving parts, and there is no connection with moving parts of the engine. The control member is a disc that floats in the path of the fuel gas and is connected with the throttle, the throttle being operated by the movement of the disc. As the velocity of the gas is dependent upon the speed of the engine, any increase or decrease resulting from variance of the load will instantly actuate the throttle. Statement is also made that a thoroughly mixed gas will be supplied regardless of the engine load. The Monarch governor can be installed on any engine without mechanical changes and after setting to any desired speed it may be locked so that it cannot be changed by the driver.

The accompanying illustration of the device explains its operation. The disc A is the control member and floats in the tapered chamber B, being connected to the

justing ring M and the spring housing L.

The spring tension is transmitted through the throttle shaft G to the throttle F, the links E and D and the lever D to the disc A, which holds it at its lowest position and the throttle open. The throttle shaft rides on two ball bearings P, and at the end of the shaft is permanently attached the lever Q, and on one end of the control lever shaft R is attached the lever S, on which is a small projection back of the lever Q. The outside end of the control lever shaft R is permanently attached to the control stop T, and on the extreme end of the control lever shaft is the adjustable control lever U. The control lever R and the throttle shaft G operate independently, except as the projection on the lever S back of the lever Q allows the governor being brought to a closed position, but loses control of all speeds above the fixed maximum when the control lever U is in a wide-open position.

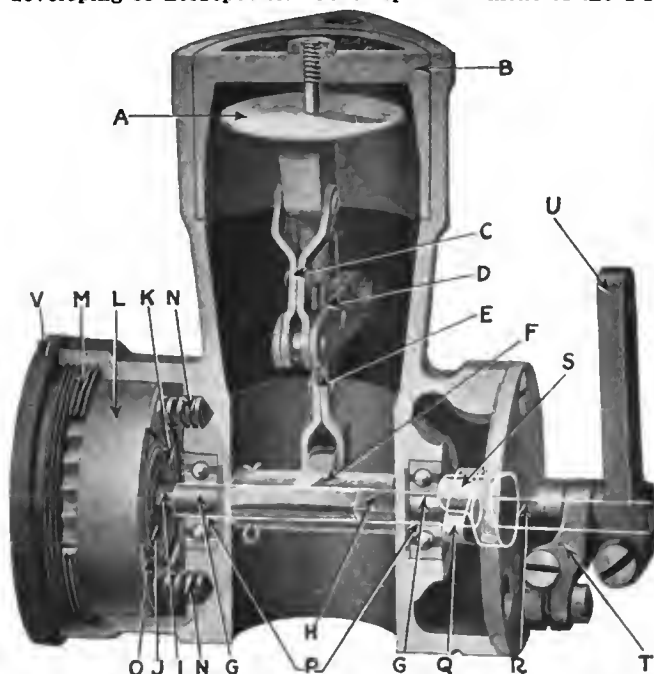
The area around the disc A in each of its different settings approximates the area of the opening around the throttle F at its different settings, this being due to the taper of the chamber B in which the disc operates. When the engine is started and the throttle is full open the speed of the gas lifts the disc to a height that is determined by the spring tension, and it is held in that position while the engine is running, so that the throttle F is held in a corresponding position, limiting the supply of gas. As the speed of the engine is decreased from any cause the speed of the gas is lessened and the disc drops and opens the throttle to admit a sufficient volume of gas to maintain the speed for which the adjustment was made before the addition of the load that caused a decrease of engine speed. When the engine load is lessened the speed of the gas raises the disc to the position to maintain the fixed maximum. When the spring tension is adjusted to cause a certain engine speed, that speed will be maintained regardless of the load.

The governor may be adjusted to secure any given engine speed by removing the locking and lock pin, unscrewing the cover V, pushing in on the finger boss on the spring housing L and turning in the direction indicated by the arrows "Fast" or "Slow," the control lever always being in a wide-open position when the setting is made. The cover, lock pin and lock must always be replaced.

#### "DETROIT FEDERALIZED."

The October issue of the "Traffic News," published by the Federal Truck Company, Detroit, Mich., is entitled the "Detroit Federalized" number, and is devoted to description and illustration of the services that Federal trucks are used for in the automobile city.

There are more than 600 Federal trucks in service in Detroit and they are used for widely differing purposes, from light 'bus service to hauling steel structural material



Vertical Section of Monarch Governor, Showing the Different Parts and the Means of Operation and Control.

cations are: Thermo-syphon cooling system, constant level splash lubrication, Tillotson carburetor with hot air attachment, selective sliding gear transmission, semi-elliptic front and rear spring, artillery type wheels and 4½ inch tires.

#### TEST BURD PISTON RINGS.

The department of agricultural engineering of the Agricultural and Mechanical College of Texas recently made a test of Burd piston rings on a tractor engine, with the result that the motor showed a nine per cent. increase in belt horsepower with the Burd rings as compared with its power development with open rings. The engine showed a 2.41 horsepower gain after two hours seating as compared with six months' seating of step lap rings.

throttle F by the links C and E and the lever D. The throttle shaft C is squared through the throttle F at H and at the end I through the spring centre J, one end of the clock spring K being permanently attached thereto. The other end of the spring is attached to the interior of the spring housing L, on the external circumference of which is a series of teeth that engage with the adjusting ring M. These teeth engage from the pressure of the two springs N on the retaining ring O. The tension of the spring on the throttle shaft G is adjusted by pushing in the finger boss of the spring housing L until the teeth of the adjusting ring M are disengaged, and turning it in either direction, when the springs N will force the spring housing L back to the original position and cause the engagement of the teeth in the ad-



**SHORT HAUL TRUCK ECONOMY.**

C. R. Norton, truck sales manager of the Packard Motor Car Company, says that the short haul fallacy, that motor trucks are unprofitable if the work is within a limited zone, is exploded, and that owners are learning that with proper loading and unloading facilities trucks can be operated as profitably on one-quarter mile as on five-mile hauls.

He cites in confirmation of this statement the work done by a six-ton Packard coal truck in the service of the Jurgan-Rathjen Company of Long Island City. Working from 8:30 a. m. till 4:30 p. m., with an hour off at noon, this truck hauled 180 tons of coal over a delivery route, the round trip being only three-quarters of a mile. Including interest on the investment, depreciation, insurance, fuel, lubricant, wages of driver, helpers and other items, the total cost was only \$15.35 for the day.

**YPSILANTI TRUCK COMPANY.**

The Ypsilanti Motor Truck Company, with capital of \$100,000, was organized at a recent meeting of the stockholders of the Globe Motor Truck and Body Company. The directors of the new company are H. R. Scovil, Charles N. Haviland, D. L. Davis, F. W. Paton, Frank R. Welsh, H. F. Schaefer and Gilbert E. Porter, all of Ypsilanti. A new factory will be constructed at Ypsilanti for the production of Globe trucks and bodies. G. E. Porter will have charge of the manufacturing and F. M. Woodward of Grand Haven, Mich., will be in charge of the sales department.

**NEW SELDEN OFFICERS.**

The annual meeting of the Selden Truck Sales Company was held at the offices of the company in Rochester, N. Y., on Nov. 6. Directors and officers were elected for the ensuing year and the new selling plan was unanimously approved. President George C. Gordon announced that the business during October had shown an increase of 349 per cent. in domestic shipments alone as compared with the corresponding period in 1915. Directors were elected as follows: George C. Gordon, William C. Barry, Jr., Robert H. Salmons, Henry G. Strong and Charles H. Stearns. Mr. Gordon was re-elected president and treasurer, William C. Barry, Jr., vice president, and Robert H. Salmons secretary.

**PACKARD EXPANDS FACTORY.**

The construction department of the Packard Motor Car Company, Detroit, Mich., is rushing to completion the new buildings which will give four acres of additional floor space to the plant. These extensions are necessary because of the inability of the producers of parts to furnish all the high standard products required and the greater demands upon the plant. The Packard Motor Car Company probably goes further than any other concern in manufacturing complete motor cars and trucks.

Two six-story wings for the stock building, the dimensions of which are 103 feet by 200 feet each, are being built. The addition to the main power house is 65 by 140 feet. A traffic garage, four-story additions to the two technical buildings, lumber sheds and a finished truck storage building are also being erected.

The demand for parts for earlier model cars and trucks made necessary the additions to the service buildings, which will be equipped with the necessary machine tools and appliances. Upon completing the new power house four immense generators will be installed.

The 66 buildings which are now on the factory site, cover 50.6 acres of land, which area will be increased to 58.6 acres after the new buildings are erected.

**AUTOCAR MADE LONG TRIP.**

Wilson & Co., successor to Sulzberger & Sons Co., one of the big packing firms of Chicago, recently sent an Autocar loaded with the company's products on a long trip from Chicago to New York, thence through New England and back to the Autocar factory at Ardmore, Penn.

Thomas E. Wilson, president of the company, sent the car out on the long journey to secure data on the reliability of truck haulage for long distances, with the idea of employing them in such service in case of a railroad strike, such as was recently threatened.

Walter Zoelimer, who drove the truck, and Walter C. Peterson of the sales department of the company, who also made the trip, states that throughout the entire distance they experienced no mechanical trouble.

**NEW BOSCH MAGNETO PLANT.**

The Bosch Magneto Company has purchased land in Chicago upon which it has started to build a branch building from which to serve its increased general business in the western states.

Nearly 15,000 square feet of floor space will be available, which is about two and one-half times as much as is now utilized. The installation department has so increased that a special department will be opened which will accommodate five times as many cars as now.

The spare parts, sales and repair departments will be on the main floor, as well as the stock room, the disassembling, washing and testing departments, packing department and installation department. The second floor will house the reception room, manager's office and trade department, as well as the superintendent's office, general office, financial department and drafting room.

**KELLY TRUCKS AT PANAMA.**

The November issue of "Like Kelly Does," contains an interesting story of the Kelly trucks in the service of the United States government at Panama. There are 19 in the service there at present and they are used for various purposes, from hauling heavy construction material to passenger carrying.

**CALCULAGRAPH RECORDS.**

An instrument that records the period of time required for any work is the Calculagraph, made by the Calculagraph Company, 9 Maiden lane, New York City, which is essentially a clock and means for printing the necessary detail for the record. The instrument is enclosed in a cylindrical case with the face of the clock exposed, with handles at either side with which the printing is done.

The record is made on cards inserted into the instrument. On these the day of the month and the time of day are printed, and the hours and the minutes are indicated by dials, the hours on one dial by 12 parts subdivided into four parts each, and the minutes on the other dial by 60 divisions. The record is begun by printing the dial, with the date and time. When the record is completed arrows are printed that point to figures on the hour and minute dials. The difference between the time first printed and that indicated by the arrows is shown in hours and minutes, and as a record of work is extremely valuable.

The calculagraph may be used to maintain record of the work of more than 100



The Calculagraph and the Manner of Making the Time Indications.

different workers without resetting the printing dies, and, of course, it is adapted to use any time of the day. It may be placed on a desk or wherever it may be convenient. An example of the use that may be made of it is supplied by the manufacturer to those interested, and is free to all inquirers who request that booklet W be sent them.

**THE "INTERNAL GEAR DRIVE."**

The Russel Motor Axle Company, North Detroit, Mich., has issued an interesting pamphlet on the "Internal Gear Drive," which was written by the largest manufacturer of motor trucks in the United States.

It is an exceptionally clear and forcible argument for the internal gear drive, and sets forth the various advantages claimed for it over other types of power transmission. The application of the power near the rim and its value are described as are also the economy effected in gasoline and oil consumption, in tire mileage and in time saved in operation, as well as in making adjustments or repairs.



## CROSS-CONTINENT DRIVE WITH GMC TRUCK

**W**ILLIAM WARWICK established a transcontinental record for a motor truck when he arrived in New York last month in a 1½-ton GMC truck after a trip of 3640 miles from Seattle, Wash.

the road officials were at fault and had to be summoned to repair damaged bridges. The truck furnished its own motor power through the entire 3640 miles and when it arrived in New York was none the worse for its long drive.

On some stretches the grades were as high as 33 1/3 per cent., and in one run of 28 miles a grade of 16 per cent. was negotiated to an elevation 6945 feet over the Blewitt's Pass. Notwithstanding these difficult grades and the many stretches where the mud was hup deep, and a gallon of gasoline to the mile was consumed, the average consumption for the trip was about eight miles per gallon.

The truck was a model 31 GMC, taken out of stock

of the Northwest Buick Company of Seattle, distributor of GMC trucks in the Northwest. No chains were used or devices for pulling machines out of mud holes, the conditions imposed being that no abnormal preparations should be made, the equipment to include only that which would be used in ordinary truck service. This fact made the record all the more remarkable, as the heavy rains had inundated the roads and in one stretch of five miles 15 bridges were washed away.

At other points the truck broke through bridges which had not been constructed to stand the heavy weight. All these handicaps, however, served to lengthen the time taken to make the trip, but had little affect upon the truck, which each time was pulled out of its predicament by its own power without damage to any part of the mechanism or chassis.

The actual running time was 31 days, most of which was spent on the National Parks Highway which connects Seattle with Chicago. Warwick was accompanied by his wife, and the necessary supplies and equipment to make themselves comfortable and provide subsistence were carried along in addition to a ton of condensed milk as freight.

The trip was made to carry out an idea of the Seattle Chamber of Commerce to show that overland freight haulage by motor truck was practical and that the National Parks Highway was deserving of more attention and use. The milk was regularly consigned by the manufacturer to a selling agent in New York City. It was delivered to the purchaser as per schedule and paid for, marking the first instance on record where a load of freight was carried from coast to coast by motor car and delivered.

The trip was probably the most trying test that a motor truck was ever subjected to, as the journey throughout was tedious and the party experienced rain at some period during every 24 hours. This made the road conditions very bad, and many detours had to be taken on account of the floods, which at times seemed almost impassable. At times Warwick had great difficulty in extricating the machine from bad mud holes, but he never lost faith in his ability to get through or called for help except where



Because of Rain Every 24 Hours of the Trip the Highways Were Soft, Deep with Mud and Occasionally Badly Flooded—Hauling the Truck Out of a Badly Swollen Stream.



The Prairie Roads Were Sometimes in Such Condition That Traction Was Impossible—Yet Driver Warwick Brought His Machine Through Without Assistance from Other Travellers.

## ELECTRIC WAGON SERVICE FOR LAUNDRIES

**P**ROGRESSIVE laundries in the larger cities are using electric wagons for delivery and collection, and the economic value of such equipment is rapidly becoming known to those who realize the possibilities of superior service. While the operators of laundries undoubtedly seek to improve their facilities for serving the public, they individually could not obtain the precise information save by experience that was presented to those who attended the annual convention of the National Laundrymen's Association of America, when Henry Sieminski, treasurer and manager of the Brunswick Laundry, Jersey City, N. J., read a paper that reflected the results obtained with electric wagons by him during a period of four years.

There was unusual significance attached to the paper, which was not presented from the aspect of the electric vehicle salesman, but was a statement from one who has to do with practical work, both with animal and power wagons, and who could judge fairly what economies were possible. The paper in part was as follows:

"About four years ago, after having had some 12 years of the usual experiences with horse drawn and gasoline delivery wagons, with their attending high cost and comparatively unsatisfactory operation, and having had the opportunity to study and partially appreciate the efficacy of electric commercial vehicle operation in many other lines of business, I decided to experiment with a few electric vehicles for the collection and delivery of the material handled by the Brunswick laundry. After four years' use of the electrics, during which time careful and complete cost accounting records were maintained, I can more thoroughly appreciate why most of the large commercial fleets, such as those of department stores, breweries, express companies, bakeries, etc., are chiefly composed of electric vehicles.

### Had Work for 65 Horses.

"The daily load average of the Brunswick laundry is approximately 1500 pounds, and at least 65 horses are necessary to do this work, allowing for emergencies. During the time we were using horse drawn wagons it was often impossible to give our patrons good service. This was particularly true in the winter, when the horses were incapable of covering their usual routes because of the severe weather and the icy streets. Added to this was the extra loss of time occasioned by the necessity of sending the horses to the

blacksmith to be sharp shod. Even with the greatest precautions accidents were bound to happen on the slippery streets, and especially on the steep grades, all of which was not only a loss to us financially and a detriment to our service, but also inhumane.

"Under the same conditions the electric quickly proves its worth. Thirty-three electric vehicles are sufficient to replace the 65 horses, and during inclement weather the only extra preparation necessary is the addition of chains, and each driver can equip his car with non-skid chains in 15 minutes. Last winter during the unusually severe weather we were able to make all our collections on time, much to the surprise of many of our patrons, who were being inconvenienced by continued delays in their milk and grocery deliveries, wherein electric vehicles were not employed. In fact, I may say that the electric is so dependable that our customers can always expect deliveries at a definite time each week within 15 minutes



Some of the Fleet of 33 Electric Wagons Used by the Brunswick Laundry, Jersey City, N. J., That Do the Work for Which 65 Horses Would Be Required.

of the hour. The calls are ordinarily made in favorable conditions and good weather.

"In electrifying our delivery service we were not obliged to discharge our former drivers and engage experienced chauffeurs, as the simplicity of the electric enabled the men who had been driving the horses to learn to operate the new vehicles very successfully in a few hours. This saved us expense and inconvenience, as there is a distinct advantage in employing men who are familiar with your patrons and routes, as well as your policies.

"The comparative operating cost and upkeep of the electric vehicle and the horse are as interesting as the facts concerning the dependability of each. Figures for the comparative investment follow:

### Investment for Horse Drawn Equipment.

1 wagon .....	\$400.00
2 horses .....	500.00
2 sets harness .....	90.00
2 blankets .....	14.00
2 rain covers .....	10.00



Type of Electric Chassis and Body in the Service of the Empire Steam Laundry, New York City.

Stable accessories .....	1.00
Stable room .....	500.00
<b>Total.....</b>	<b>\$1515.00</b>
Investment for electric delivery car—complete .....	\$2500.00

"The extra investment necessary for the 'electric' is, therefore, approximately \$1000. But the initial cost is not the only thing to be considered. The following figures furnish conclusive evidence of the economy in the operating cost of the electric:

#### Monthly Cost of 65 Horses and Wagons.

Monthly feed bill @ \$17 per horse.....	\$1105.00
4 stablemen @ \$60 per month.....	240.00
1 harness cleaner .....	60.00
1 wagon washer and helper.....	100.00
Horseshoeing @ \$2.50.....	162.50
Harness bills @ 50c per horse.....	32.50
Veterinary @ 20c per horse.....	13.00
<b>Total.....</b>	<b>\$1713.00</b>

#### Monthly Cost of One Electric Delivery Car.

6 per cent. interest on \$1000 per month.....	\$5.00
Electric current @ 16c per day.....	4.00
Night mechanic per car.....	3.00
Day mechanic per car.....	3.00
Wash man and helper.....	4.00
Battery depreciation.....	10.00
<b>Total.....</b>	<b>\$29.00</b>
<b>Total for 33 cars.....</b>	<b>\$957.00</b>

#### Saving of More Than 40 Per Cent.

"The depreciation of the car is not included in these figures, but this is balanced by the depreciation of the horses, wagons, harness, etc. Thus the electric shows a saving of over 40 per cent.

"The electrics of the Brunswick laundry average 25 miles per day, visiting all the outlying suburban districts. Some of the best drivers deliver as many as 900 bundles per week, and make an average of 32 miles per day. At an average of 25 miles per day and a current cost of \$4 per month, the current cost per mile is about .6 of a cent on this basis, figuring 900 bundles delivered per week, the energy cost of each bundle delivered is about 1/100 of a cent. In other words, the current consumed in delivering 100 bundles costs about one cent. This is reducing economy to well nigh the irreducible minimum.

"Every week one of our electrics is taken down,

carefully looked over, cleaned and put in first class order. Thus every 33 weeks each car goes through a thorough overhauling, and as this work is done by our men in their spare time, no additional labor is required. The vehicles never show any particular wear, except possibly the driving chains. The average life of the tires on the gasoline cars which we have used for long hauls is about three to four months, while those on our electric vehicles last from a year and a half to two years.

#### Other Factors of Service Value.

"The advertising value of the electric must also be considered. As compared with a horse drawn delivery wagon or gasoline car, the electric has the distinct advantage of being clean and odorless, and is almost noiseless. The cleanliness is an especially important feature, as any woman in selecting a laundry would be rather sceptical of the efficiency of a company whose men looked like a lot of blacksmiths from the dirt and grime of a gasoline car, or who had the disagreeable odor of horses and stables about them.

"The safety element of the electric should be mentioned. Collisions are very rare things with these cars, even in congested traffic, as they are started and stopped so easily. Our cars are geared for a maximum speed of 10 miles per hour, which I consider sufficient for any heavy vehicle running through the city streets.

"In purchasing electric cars for laundry service, as for any work, the load must be considered, and a vehicle of suitable size and capacity should be chosen. The bodies of the delivery cars which the Brunswick laundry use are 4½ by 5 by 7 feet behind the driver's seat.

"Since we have been operating the electric delivery cars our business has more than doubled itself, and while I do not credit this entire growth to the electric I believe the improved service made possible by the electric, the attractively painted, silent, clean car, and the neat appearance of our drivers have all played large parts in gaining new customers.

"We generate our own power and charge our electric vehicles at night, then with the exhaust steam we heat a sufficient volume of water to be used the next day—thus eliminating the necessity of the use of live



Attractive Type of Equipment Utilized by the Keystone Laundry, Pittsburg, Penn., Which Recently Motorized Its Service.

steam in the water heaters during the day. The distilled water which we use for our nickel-iron batteries is available in any laundry—the condensed steam from the ironing machines—and is therefore a by-product as well as the current used in charging the batteries. The garage of the Brunswick laundry is 50 by 140 feet—and this is now being duplicated, which will provide space for about 45 electric vehicles.”

There are a number of instances of record in the laundry industry where the trial of electrical delivery wagons have led to their installation. The Sanitary Laundry of Hartford, Conn., installed one electric vehicle, and between Sept. 6, 1913, and Oct. 23 of the same year the car had covered 1545 miles. Two teams were disposed of when the “electric” was placed in service and the two remaining horses at that time were covering 70 miles a week instead of 100, which they formerly covered, the difference being cared for by the excess service performed by the electric.

The Charity Organization Society of New York City has three electric vehicles in the service of its laundry, which have reduced the cost of delivery at least 20 per cent.

The Salem laundry of Salem, Mass., installed one electric delivery car in December, 1915, and within six months an order was placed for six more cars of the same type.

An order for four additional electrics was placed by the J. Arthur Anderson laundry of St. Louis after the first wagon had been in use for several months, and similar orders were placed by the Pilgrim and Crystal laundries of Brooklyn, N. Y., after they had tested out electric wagons in the collecting and delivery service.

The Keystone Laundry Company of Pittsburg, Penn., after a thorough investigation of its collection and delivery costs recently ordered five electric vehicles. One of these electrics on a test run showed 63 miles on a single charge of the battery, carrying a load of 642 pounds in addition to the driver and official observer. The cost of the current was 49 cents, or four-fifths of a cent per mile.

### EUROPE PREPARING FOR BIG BUSINESS.

John Barrett, director general of the Pan-American Union, who recently made a trip through France and England with the object of studying commercial condition and prospects, in a preliminary report on his conclusions says that Europe is preparing for the end of the war. He says:

“A most powerful semi-official organization and movement has been quietly, but effectively started in both England and France, not only to make now an extraordinary effort to maintain their present trade with the Americas and regain what may have been lost during the first two years of the war, but to prepare ahead for a greater effort after the war in building up this trade than they ever made before.

“Under conditions which amount to encouragement and almost to actual government aid, a large variety of industries heretofore little developed, and hence figuring slightly in the foreign trade of these countries, is being rapidly developed, and will surely play a prominent part in their future commerce and in competition with the United States and other countries.

“A vast practical army of very skilled but reasonably paid labor is being trained and developed all over Great Britain and France in the form of women workers, who will increase immensely the efficiency of manufacture and the volume of output of foreign commerce, despite the loss of male and skilled labor resulting from the war.”

### BETTER SERVICE IS ECONOMY.

The Laclede Christy Clay Products Company of St. Louis, Mo., has installed a truck equipment in its delivery service and has found that the trucks can do



Motorcycle Fire Department Equipment Used in Chicago to Answer Still Alarms and Quick Emergency Runs.

from three to four times the work done by the horse drawn equipment that was previously used. The cost records kept by the company show that the truck delivery entails an expenditure approximately the same as for the horse haulage, but the trucks afford better service and the company can better serve its customers with greater satisfaction.

### TRUCK MAKERS SEEK FACTORY.

Mayor Hagarty of Hartford, Conn., has received a letter from C. K. Thomas of No. 639 West 51st street, New York City, president of the Thomas Motor Truck Company, in which the latter states that his company is seeking a site for a new motor truck plant.

The letter also stated that a merger of three or four motor trucks companies is being contemplated, which would produce 1200 trucks the first year and would employ between 500 and 600 hands.

## TRACTOR MAKES ORE PAY.

### Knox Machine Hauling From Mine to Smelter Shows Large Economy.

A Knox tractor with trailer equipment, put in service in Utah hauling ore from the Cardiff mines to smelters in Salt Lake Valley, a distance of 16 miles, is doing haulage for the contracting firm that operates it that had been economically impossible with any equipment previously used, and the cost has been reduced to what is extremely satisfactory.

Both horses and gasoline trucks had been tried in the work and for one period a caterpillar tractor was worked, but none of these equipments could be operated cheaply enough to make the mining profitable, and the owners of the mines were considering the advisability of building a railroad over the route when a contracting firm experimented with its Knox outfit and met every requirement. Eleven demonstrations were made and then both the mine officials and the



**Knox Tractor and Trailer Train Hauling Ore from Cardiff Mines to Salt Lake Valley on Heavy Mountain Grades.**

contractors were satisfied that they had found the quickest, cheapest and most efficient method of getting the ore to the smelters.

The model 36 tractor used has a five-ton ore body and the two five-ton Troy trailers are fitted with regular steering apparatus, roller bearings and 36 by seven-inch tires. The tractor is equipped with steel wheels 14 inches wide, on the rims of which are diagonal cleats. A total of 272,660 pounds were hauled during the demonstration and although coal was not taken back on every return trip, a total of 27,080 pounds of coal was hauled back to the mines. About 21 gallons of gasoline and two quarts of lubricating oil were consumed during each trip and two trips were made every 24 hours.

One of the big difficulties met with in the haulage is the steep grades to be climbed going from the mines loaded to the smelter. These grades in many places are 16 per cent., but the brakes on the tractor are so efficient that they will hold the train in check, so that the operator can pass traffic at any speed or at any

time while climbing the grades. While hauling 18 tons the operator has brought his machine and the trailers to a full stop within 10 feet on the steepest grades. The work during these demonstrations was probably heavier than will be ordinarily experienced, but no repairs were necessary during the 11 trips.

## PENNSYLVANIA SECTION, S. A. E.

John Younger, chief engineer of the truck department of the Pierce-Arrow Motor Car Corporation of Buffalo, N. Y., will be the principal speaker at the meeting of the Pennsylvania S. A. E., which will be held at the Engineers' Club, 1317 Spruce street, Philadelphia, on Thursday evening, Nov. 23.

## DAY BAKER LEAVES GENERAL VEHICLE CO.

Day Baker, who was for several years located in Boston as the sales representative and district manager of the General Vehicle Company, and who was later attached to the executive offices at Long Island City, N. Y., has severed his connection with the company. Mr. Baker, more than any other man, developed the use of electric vehicles in New England and is widely known as an authority on highway transportation.

Mr. Baker has not determined his future. For two months he has visited automobile factories in the West and Middle West, his intention being to obtain eastern representation of a leading make of machines. Mr. Baker is widely known, has an extremely large number of friends, and is a tireless worker. There is little doubt of his success in whatever work he engages.

## TRUCK PLANT AT ALLENTOWN.

D. George Dery, reputed to be the largest silk manufacturer in the world, and Martin E. Kern, vice president of the Penn Counties Trust Company of Allentown, Penn., are interested in a new truck enterprise which is to be established in that city.

A tract of land fronting 1500 feet along the tracks of the Central Railroad of New Jersey was recently acquired as a site for the new plant.

## FOREIGN TRADE FOR YEAR.

The exports from this country during the past fiscal year were \$4,345,000,000, and the imports were \$2,180,000,000.



## SEVEN SIZES OF GRAMM-BERNSTEIN TRUCKS.

**T**HE series of trucks manufactured by the Gramm-Bernstein Company, Lima, O., is one of the largest produced by any single manufacturer in the American motor vehicle industry. Including as it does units that have load capacity of 2000, 3000, 4000, 5000, 7000, 10,000 and 12,000 pounds respectively, and claim is made that any haulage requirement can be supplied with a size that will be practical from the viewpoint of operating efficiency and economy. The policy of the company is to build what will meet every demand save those for which the smallest and lightest vehicles may be used.

The Gramm-Bernstein Company's machines were first known as B. A. Gramm's trucks, but later on the firm name was adopted as being the more logical and more certain of identifying the manufacturer. The company was established by B. A. Gramm, who has been actively engaged in the industry for upwards of 15 years, who associated with him a number of successful men, and the initial production was a much smaller series. But with increased demand the number of sizes has been added to until there is a load capacity that will approximately serve for any transportation need.

The company was established in a new plant, with adequate facilities for manufacturing, and statement was made that the machines produced would be to a standard for each type, which standards would be continued and without material changes, for there was belief that the vehicles measured up to all requirements of good engineering. The production of Gramm-Bernstein trucks has been extremely large, a considerable part of the output being sold for export, and the factory has been constantly increased to keep pace with the domestic and foreign sales.

A short time since the capital of the company was largely augmented and plans were made to manufacture trucks in still larger numbers, and the sales policy was adapted to even more systematically stimulate distribution of them, not only in America, but abroad. The company has made no statement as to what the probable production will be during the coming year, but there is reason to believe it will much exceed the total of any previous year. One factor that will probably have material influence is the large number of types or load capacities, and another is the development of the selling organization so that there is now representation in practically all the commercial centres of importance.

In the production of seven different sizes of trucks one will understand that there must necessarily be variance in proportions of parts, but in general design there is but little difference in the machines aside from the dimensions of components. To illustrate, all trucks have power plants with the engines and clutches independent of the transmission gearsets, and all are driven by worm shafts and worm gears. Some of the engines of the smaller sizes are the block type and those of the large machines have the cylinder units cast in pairs. Similarly, the transmission gearsets of some of the small trucks have three forward speed ratios, and those of the larger have four forward speed ratios.

### Trucks Have High Quality.

But aside from these details there are practically no differences in the designs. The engines are built by a single manufacturer, for instance, and there is uniformity of material, workmanship and production methods and insurance that the quality standard is maintained. The trucks are not cheap in the sense that they are sold for low prices, for the market values are generally more than those of machines of similar capacities, but the claim is made that the highest qualities that make for operating efficiency, economy and en-

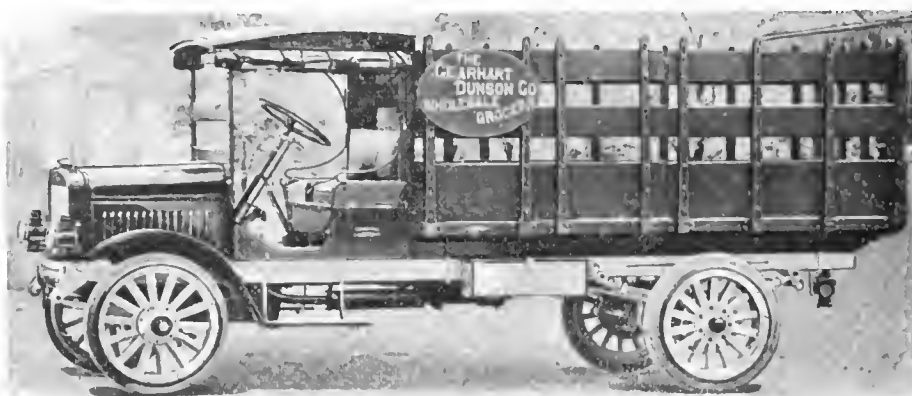
durance are represented in them and fully justify the valuations.

The chassis are sold for the following prices, which include oil dash and tail lamps, horn, jack, full set of hand tools, hub odometer, fenders, running boards and drivers' seats. When desired electric starting and lighting equipment can be furnished at additional prices: 2000-pound chassis, \$1650; 3000-pound chassis, \$2000; 4000-pound chassis, \$2300; 5000-pound chassis, \$2700; 7000-pound chassis, \$3400; 10,000-pound chassis, \$4300; 12,000-pound chassis, \$4500.

The wheelbase and tread of these chassis are: 124 inches wheelbase and 65½ inches tread for the 2000-pound chassis; 130 inches wheelbase and 56½ inches tread forward and 61 inches tread rear, for the 3000-pound chassis; 146 inches wheelbase and 56½ inches tread forward and 62 inches tread rear for the 4000-pound chassis; 156 inches wheelbase and 57 inches tread forward and 62 inches tread rear for the 5000-pound chassis; 158 inches wheelbase and 62¾ inches tread forward and 66 inches tread rear for the 7000-pound chassis; 168 inches wheelbase and 72 inches tread forward and 76 inches tread rear for the 10,000-pound and the 12,000-pound chassis.

### All Engines Are Long Stroke.

The engines of the trucks are all long stroke types. That of the 2000-pound chassis is with cylinder bore of 3½ inches and stroke of 5¼ inches, rated at 19.6 horsepower by the S.

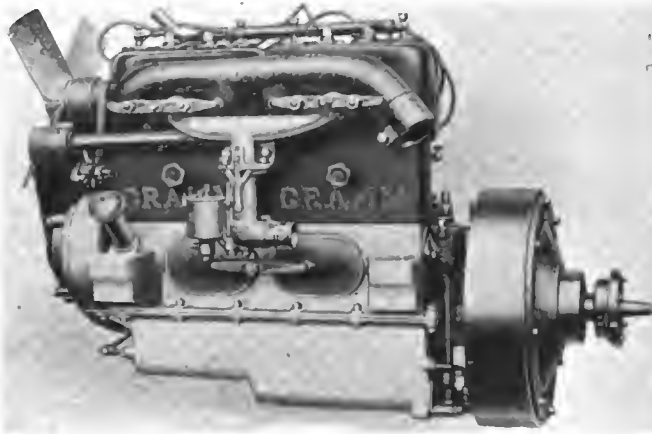


Gramm-Bernstein Chassis, 5000 Pounds Load Capacity, Equipped with Cab and Stake Body for Wholesale Grocery Distribution.

A. E. formula; of the 3000 and 4000-pound chassis, 3¼ inches bore and 5¼ inches stroke, with rating of 22.5 horsepower; of the 5000 and 7000-pound chassis, 4¼ inches bore and 5¼ inches stroke, with rating of 28.9 horsepower, and of the 10,000 and 12,000-pound chassis, 4½ inches bore and 6¼ inches stroke, with rating of 32.4 horsepower. There are four different sizes of engines, and the bore to stroke ratios are, in the order stated, 1:1.50, 1:1.40, 1:1.35 and 1:1.50. All of these will considerably exceed the rated horsepower.

The cylinders of the two smallest engines are cast en bloc, and those of the other two are cast in pairs. The material is a high grade of semi-steel that affords exceptional strength and endurance. The engine blocks and the cylinder units are cast with the water jackets integral, but the heads of the water jackets are large plates that are secured with a series of cap screws. This construction insures uniform thickness of the walls and freedom of the water passages from obstructions. Much care is taken to guard against possible defects, the castings being tested five times while being machined and finished.

All the crank cases are two-section construction, being cast from aluminum alloy. The upper sections carry the three main bearings, the centre bearing being in a heavy transverse vertical web. There are openings in the sides of these sections, that are closed with plates, retained by finger nuts, by which work or inspection may be conveniently done. The lower sections of the crank cases form the reservoirs for the oil and carry the oil troughs into which the con-



One of the Four Sizes of Engines Used in Grammm-Bernstein Chassis, Showing the Valve Side.

necting rods dip. The pistons are carefully turned and fitted with three rings each.

#### The General Engine Construction.

The crankshafts are drop forged from chrome nickel steel, heat treated, having tensile strength of 140,000 pounds and elastic limit of 118,000 pounds. These shafts are forged with the flywheel flange integral. The journals and the crankpins are ground accurately to standards. The journals are all unusually long and the total bearing lengths of the shafts considerably exceed those of many engines of similar horsepower rating. The camshafts are steel drop forgings that are mounted on three bearings.

The connecting rods are heat treated steel drop forgings and the wristpins are steel tube that are hardened and ground. The valves are nickel steel and the valve tappets are a roller type with adjusting screws and locking nuts. The valve mechanism is enclosed by cover plates that are quickly removable. The main and connecting rod bearings are Fahrig metal in brass shells, and the connecting rod caps are retained by four bolts each and are adjustable with shims. The other bearings are phosphor bronze bushed and are large size to insure endurance.

The timing gearset gears are of steel and semi-steel with wide faces and are helical cut to operate without noise. All the work on the engines is very close and provision is made for abundant lubrication and complete restoration in the event of wear. The engines are lubricated by a combination system, the oil being drawn from the reservoirs by pumps and forced through tube to the timing gearset and main bearings, the lubricant flowing to oil troughs below the connecting rods. The cylinders, pistons, wristpins, connecting rods, camshaft, cams and valve tappets are lubricated by splash. The claim is made that the connecting rods establish the oil level regardless of the position of the engine.

The engines are cooled by water circulation, thermo-sy-

phon systems serving in the two smaller sizes and forced by bronze centrifugal pumps in the two larger, radiation being obtained by large radiators having cast top and bottom tanks, with copper helical tube cooling sections. These sections are retained by series of bolts and are interchangeable, so that they may be quickly removed or replaced in the event of damage. Back of each radiator is a sheet metal shroud, in an opening in which the fan revolves, directing a strong current of air through the cooling section. The fans are mounted on adjustable brackets and are driven by flat belts from pulleys on the extensions of the magneto shafts.

The ignition current for the two smaller engines is generated by single high-tension magnetos, and for the larger engines dual systems are installed. Each engine is governed by a governor driven from the timing gearset that is adjustable as to speed, that is sealed, self-lubricated and is non-hunting. The 2000 and 3000-pound chassis are governed to 18 miles an hour, the 4000-pound chassis to 16 miles, the 5000-pound chassis to 15 miles, the 7000-pound chassis to 14 miles, the 10,000-pound chassis to 12 miles and the 12,000-pound chassis to 11 miles. The fuel is supplied through automatic float feed type carburetors, the purchaser having option as to which make is believed best.

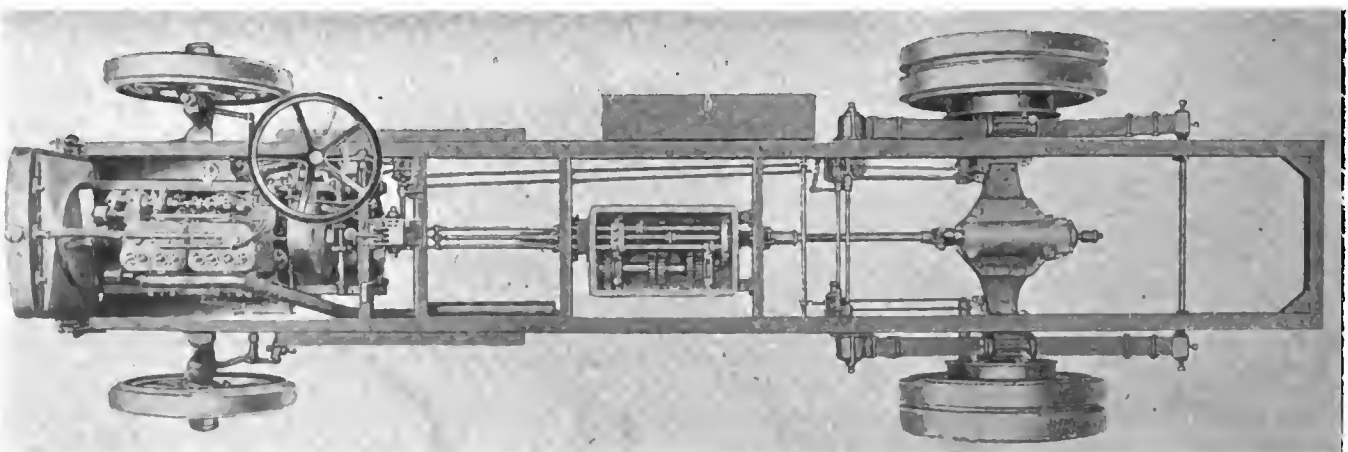
#### The Power Transmission Systems.

The engines are mounted on sub-frames that are suspended on three points to insure against stresses from chassis distortion, and with them are incorporated the dry plate multiple disc clutches, the discs being faced on one side with raybestos. The efficiency of the clutches is not influenced by atmospheric conditions and they are said to be very easy when engaging and extremely enduring. The clutches are connected with the transmission gearsets, which are suspended from three points from frame cross members, by shafts having universal joints at either end.

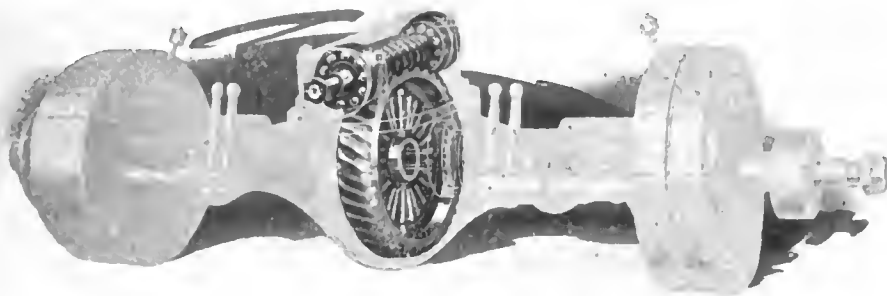
The Grammm-Bernstein transmission gearset is built only by this company, which controls the patents. It is a constant mesh type, so that there cannot be clashing or damage of gears when changing speed ratios, and it is maintained to be positively error proof. The shafts and the gears are nickel steel, of large size, heat treated, and the shafts and individual gears on the optional shafts are mounted on ball bearings of unusual size, with special provision for lubrication. The changes are made by the engagement of dog clutches that are very heavy, and the shifting rods are controlled by an interlocking device that prevents changing to more than one ratio at a time. This is so designed that all gears must be in neutral position before a change can be made. Claim is made that this type of gearset and control materially lessens the mechanical wear of the chassis and minimizes repair expense.

#### Rear Axles Are Semi-Floating Types.

From the gearset to the rear axle the drive is by short shafts with two universal joints. The rear axle is the Sheldon semi-floating type, the construction of which differs slightly with the size, the housing being either a single-piece casting or sectional. The central section or bowl of the axle housing encloses the worm shaft, worm wheel and the differ-



Top View of a Grammm-Bernstein Chassis, Showing the Suspension of the Power Plant and with the Transmission Gearset Cover Removed to Show General Construction.



Phantom View of a Sheldon Semi-Floating Rear Axle That Shows the Mounting of the Worm Shaft and the Worm Wheel.

ential gearset, which are assembled on the cover or carrier, which is bolted to the axle housing. The worm shaft is mounted, as is the differential gearset, on annular ball bearings that are not adjustable, and when the assembly has been adjusted at the factory it is unnecessary to give it further attention than cleaning. The axle shafts are mounted in the differential gears and on bearings in the ends of the axle housing, the wheels being keyed and secured to the shafts by nuts. The bearings are retained in the axle housings by plates that are bolted to them. The wheels are so constructed that they may be quickly removed from the shafts, for by taking out special cover plates that are spring retained and putting in special bolts, the hub caps are utilized as pullers. These axles are constructed to be used in the Hotchkiss system of drive, the driving thrust and torque being absorbed by the springs.

#### The Chassis in General.

The front axles are I section nickel steel drop forgings, with the spring seats integral. The spindles and hubs are built so that standard annular or roller bearings may be used interchangeably. The steering knuckles are heavy and all pins and bolts in the linkage are hardened and ground and all wearing surfaces have hardened and ground steel bushings. The spindles are fitted with roller bearings. The frames are pressed steel channel sections with wide webs, each having six cross members that are strongly gusseted. Much care is taken to obtain frame strength. These are suspended on semi-elliptic springs by heavy hangers. The springs are unusually long and are constructed for the Hotchkiss system of drive, to insure against breakage, with supplementary main leaves. The wheels are equipped with solid tires, these being as follows in the order of truck sizes, from smallest to largest: 34 by three inches forward, 34 by four inches rear; 34 by 3½ inches forward, 36 by five inches rear; 34 by four inches forward, 34 by 3½ inches dual rear; 36 by four inches forward, 36 by four inches dual rear; 36 by five inches forward, 40 by five inches dual rear; 36 by six inches forward, 40 by six inches dual rear; 36 by seven inches forward, 40 by seven inches dual rear. The wheels are wood, artillery type and heavily built.

The steering gears are Ross constructions—worm and nut type—they being so designed that wear can be compensated by quickly made adjustments, and all are fitted with spark and throttle levers below the hand wheels. The linkage is very heavy, with provision for restoration in the event of need. The steering columns are at the left sides of the machines. The control is by the usual foot pedals for the clutch and service brakes and the gear shifting and emergency brake levers are at the centres of the footboards. Both sets of brakes are large size and operate on and in drums on the rear wheels. They are equalized.

When the chassis are to be used with dumping bodies supplementary gearset cases are bolted to the side of the transmission gearset case and

coupled with the main driving shafts. This gearset drives a shaft having two universal joints that actuates a pump. There is a hydraulic hoist, having a cylinder and piston mounted upright on the chassis, and this pump circulates a volume of oil into the cylinder that forces the piston upward. The piston carries a shaft on which are mounted two pulleys, on which wire cables are seated, and as these cables are anchored to the chassis and to the forward end of the body, the movement of the piston raises or lowers the body.

Connection with the pump is made with a clutch and an automatic cut-

out prevents the body being raised above the angle set for dumping. The body may be hoisted and locked at any desired angle. The supplementary gearset can be used for any equipment requiring special power. It is a patent device owned by the Gramm-Bernstein company.

The trucks are carefully developed with regard to endurance, the bearings being unusually large, for instance, and special provision is made for lubricating all moving parts. The universal joints are a special fabric disc heavy duty type that are similar in design to those used with much success in Europe, and are maintained to be superior to any others because of simplicity and that they require neither lubrication or adjustment. The chassis will be equipped with any type of body built to the specifications of the purchaser.

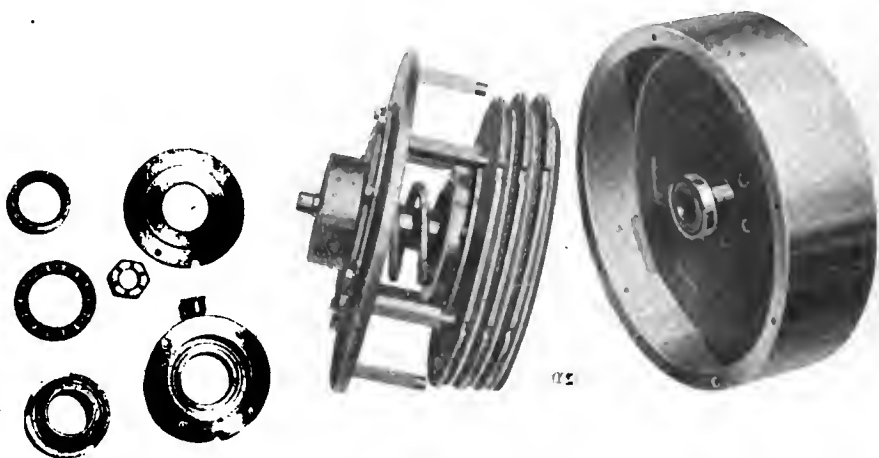
The distribution of Gramm-Bernstein trucks in the eastern section of the country is directed by C. W. Moody, eastern sales manager, 1457 Broadway, New York City, who has developed a very efficient sales organization and established service stations in many cities in the Atlantic Coast states.

#### SELDEN WILL HAVE HOME BRANCH.

The Selden Truck Sales Company of Rochester, N. Y., which handles the sales of Selden trucks, will establish a sales branch in that city under the name of the Selden Motor Truck Sales Company, which will be opened about December. George S. Holvey, who has been operating as the Holvey Motor Truck Sales Company of that city, will be in charge of the new branch.

#### H. A. DEHART TO BUILD BODIES.

H. A. DeHart, the well known wagon builder of Thoroughfare, N. J., has commenced the manufacture of motor truck bodies. The addition of this line to the company's product resulted from the quite general use of motor trucks by the farmers in New Jersey.



The Components of the Gramm-Bernstein Dry Plate Multiple Disc Clutch and the Flywheel, Partly Disassembled.

### PITTSBURG MAIL SERVICE MOTORIZED.

Nov. 1 the horse equipment of the Pittsburg, Penn., postoffice was converted to motor driven vehicles, there being now 42 machines, ranging from 1000 to 4000 pounds load capacity in service. These are used to carry the mail to and from the railroad terminals carrier stations and the central postoffice, and all mail collections are made with them. The trucks are now in a temporary garage, but a permanent service station is now building which will be devoted exclusively to the storage and maintenance of the machines.

With the motorization of the equipment a series of changes for the betterment of the service, largely made possible through improved methods of collection and distribution, will be made. As now utilized two of the trucks are used for transfer between the postoffice and the railroad stations, 12 carry the mail between the postoffice and the sub-stations and 28 are used for collecting from street boxes and buildings.

### GAS MEASURING DEVICE PATENTED.

A patent has been granted to H. E. Maurer of Springfield, Ill., for a gas measuring and dispensing device, which, it is claimed, delivers a full measure of gasoline to the purchaser in such a manner that the latter can satisfy himself that he is receiving all he pays for. The gasoline is forced from the storage tank by compressed air instead of by a mechanically operated pump.

### TRUCK SUBMARINE TENDERS.

Where submarine vessels are stationed, which does not necessarily mean a navy yard, although all the submersibles in this country are government craft, there is need of supplies of fuel and oil in large quantities. As these stations may not be permanent, and seldom are for that matter, storage facilities are not usually

provided for either gasoline or lubricant, so that these must be brought to the pier or dock as often as needed.

For such service as this the large tank truck is practically the only means of haulage that is absolutely dependable, and with the use of such machines the time of the vessels can be conserved. In the event of actual warfare the supplies for the vessels would be a matter of decided importance, both as to transportation and storage.

### RITTMAN PROCESS RESULTS.

Less than a year has elapsed since announcement was made that the Rittman "cracking" process of refining gasoline promised to reduce the high prices for engine fuel that at that time obtained, but present information on the subject secured from refiners seems to indicate that the manufacturers have little hope that the process will materially cheapen the cost of gasoline production.

Some refiners using the process say that it is impractical commercially, while others have ceased to use it, and still others have not as yet operated the Rittman process equipment which they installed.

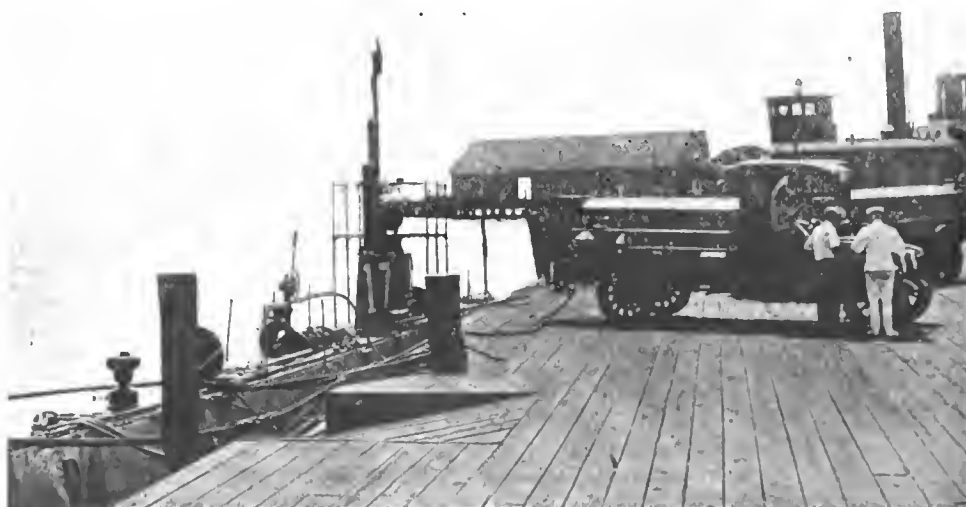
### SAFETY FIRST FEDERATION.

Uniformity in traffic regulation, the railroad trespass question, fire prevention and health and sanitation will be discussed at the second annual convention of the Safety First Federation of America, which will be held in Baltimore from Dec. 7 to 9 inclusive.

### WILL GROW ITS OWN COTTON.

The Goodyear Tire and Rubber Company, Akron, O., has purchased 10,000 acres of land in Arizona and will use the tract for the cultivation of long staple cotton. It is understood that additional acreage of 20,000 to 25,000 acres will be acquired by leases to run for five years. The land lies in the Salt River valley, several miles south of Chandler, Ariz. It will have to be irrigated and plans have been made for sinking wells and erecting a cotton gin and cotton seed oil mill. Over \$500,000 will be expended by the subsidiary company that will control the plantation and it has been given a long term contract to furnish parent company with long staple cotton.

The plantation will be headed by L. M. McDevitt of Pomona, Cal., and will be in charge of E. W. Hudson.



White Truck Tank Used as a Tender for Supplying Fuel to the Naval Submarine Vessels at New London, Conn.



## TRUCK HAULAGE MAKES BIG BRIDGE POSSIBLE.

CLEVELAND'S new \$4,000,000 high level bridge, the longest double-deck, three hinged arch bridge in the world, which is now nearing completion, stands as a huge monument to the motor truck and its accomplishments, as this wonderful example of modern engineering was largely made possible by the wonderful service rendered by 44 White motor trucks in hauling the thousands of tons of materials that were necessary for its erection. A good idea of the magnitude of the undertaking is gained from the following figures of the material handled: 543,000 sacks of cement, 62,692 tons of sand, 15,653 tons of limestone, 108,900 cubic yards of mixed concrete, several thousand yards of slag and many tons of miscellaneous material, tools and incidental supplies.

The fleet of White trucks were used by eight different contractors that were employed in the work and they hauled over 60 per cent. of all the material used in the construction of the bridge.

According to the engineers who planned and supervised the work, the undertaking would have been economically impossible because of the great cost if trucks had not been utilized for the haulage work necessary with the contract. It was estimated that in certain phases of material transportation one truck could make four trips to a team's one, hauling 24 tons, while a team could haul but three. During the concrete construction the trucks made practical an exceptional economy of both time and money, by hauling the cement, sand, gravel, slag and limestone to the mixers and then taking the mixed concrete to the forms. The progress of the concrete work was very largely dependent upon reliable and quick motor truck service. Materials had to be obtained in sufficient quantities to keep the giant mixers busy, and the concrete had to be rushed to the forms, as all the units of the job were poured continuously, making it absolutely necessary to keep a constant supply of concrete ready.

County Bridge Engineer Yesiger, the designer of the bridge, in speaking of the work done by the White trucks on the job, said: "We have watched the work of the trucks with great interest and they have been very satisfactory. They have hauled enormous quantities of materials in the shortest possible time and are the only mode of transportation that could be depended upon to keep the mixers busy."

**Truck Paid for Itself on Job.**

Chief Engineer Harry Hilton of the Hunkin-Con-

key Construction Company, which had a large contract on the superstructure, in commenting on the dependability of White trucks, said that his concern is well satisfied with its White trucks, which had proven to be great money savers and money makers. "When we started work on the bridge," he said, "we were paying an extra price to the supply houses for all concrete materials that had to be hauled from their docks to the job. Later we figured that we could buy another White truck, haul our own material, the truck paying for itself with the difference in hauling costs, and we would be a truck ahead at the end of the job. The contract is now 75 per cent. completed and the truck has already paid for itself, together with all upkeep charges. Besides this, it had time to haul steel, supplies, forms, etc., and make trips to other jobs which we have in the city.

"One of our White five-ton power dumping trucks loaded with  $2\frac{1}{2}$  yards of mixed concrete had no difficulty in walking right up the Detroit avenue hill on



The \$4,000,000 Bridge at Cleveland, O., That Has Been Built Largely Through the Haulage Economies Practical with Fleets of Motor Trucks.

the west end of the bridge, which has a grade of more than 10 per cent. In using the trucks to haul concrete from the mixers to the forms all the units of the job had to be poured continuously and it was very essential that this handling be done with a dependable truck, as a break down in the middle of the job would be very serious."

**Worked Two Months Continuously.**

A fleet of six White five-ton power dumping trucks, operated by R. W. Blake, a hauling contractor, worked 24 hours a day for over two months continuously in hauling concrete material for building the west piers. This material was hauled over a mile route, the trucks crossing two draw bridges, a railroad and climbing the Detroit avenue hill with 12 per cent. grades. During this work one truck made more than 35 trips in 10 hours, hauling approximately 175 to 200 tons of materials. The wide bodies, according to Mr. Blake, made it easy to load them quickly from a clam shell bucket without any overspill, and the entire load could be





Truck Ready to Dump Load of Mixed Concrete into Lift That Carried It to Top of Hoist, Where It Was Distributed by Gravity to the Forms.

dumped into the mixers in less than a minute. Last April the Blake fleet of trucks, including six Whites and seven of other makes, was destroyed by fire. The day following the fire Mr. Blake went to the White factory and placed an order for 11 five-ton White dumping trucks, which are still engaged in hauling material to the bridge.

A fleet of nine White trucks, owned by the Cleveland Builders' Supply Company, hauled approximately 400,000 sacks of cement and miscellaneous other materials to the new bridge, the trucks averaging two miles to a round trip.

#### Nothing Else Could Do the Work.

The Cuyahoga Supply Company, with a fleet of four White trucks, hauled 180,000 sacks of cement to the bridge, hauling the material from the company's warehouses, three-quarters of a mile from the bridge, and each truck was loaded, carried the material to the bridge and returned to the warehouse within a 30-minute period. In speaking of this work, Mr. W. A. Fay, president and general manager of the company, said: "Motor trucks have greatly speeded up this work. It is certain that we could not have used any other means of transportation to haul materials in sufficient quantities to keep the mixers busy and delay for want of material would have been critical. Our White trucks performed perfectly. They are economical to operate and not one of them has shown any signs of wearing out."

The four White power dumping trucks of the Cleveland Macadam Company hauled several thousand cubic yards of slag for one of the east piers of the bridge. The trucks made four trips an hour, covering two miles to a round trip and climbing Main street hill with a 10 per cent. grade.

"One of our White five-ton power dumping trucks used," said A. D. Bender, secretary of the company, is the third power dumping truck built by the White company. We purchased it in April, 1911, and it has covered over 100,000 miles and still shows no signs of

wearing out. This particular truck paid for itself in the first four months it was in our service and in addition it earned the cost of a complete new set of tires.

"We are particularly pleased with the White hoisting device. We have tried trucks of other makes with the result that the hoists break frequently and then the trucks are out of service sometimes a week or 10 days at a time. We estimate the earning power of our trucks at \$25 a day, so you can see what a loss out-of-service trucks incurs to us. The only trouble we have ever had with the White hoist is to replace a few screws every 18 months to two years."

#### ELECTRIC TRUCKS IN AMERICA.

Owing to the great predominance of the gasoline vehicle, which is evident in every city, the average person does not realize the extent to which electric trucks are used by merchants and manufacturers. A recent survey showed that there were in the neighborhood of 10,000 electric vehicles being used for freightage purposes in the United States. These trucks and delivery wagons are used in 124 different lines of trade.

#### BURGESS TO BUILD WAR TRACTORS?

The Burgess plant at Marblehead, Mass., well known as a manufacturer of flying machines and yachts, has secured an order from the United States government for the manufacture of armored tractors. These machines are said to be not unlike the famous "tanks" that the British used in the battle of Comblès in France.



Material Lifted from Barge by Clamshell Bucket on the Pier Being Loaded by Gravity from Chute—The Loads Were Dumped in 30 Seconds.

## Highway and Agricultural Tractors.

### Wide-Spread Interest Among Farmers by Demonstrations Has Stimulated Manufacturing Interests to Production.

This department will be a regular feature of the **MOTOR TRUCK**, and it will present the activities and advancements of the industry, as well as considering the uses of tractors, from viewpoints of practicality and economy.



Moline-Universal Tractor and a Cultivator, This Being a Typical Equipment Used During Demonstrations.

THOSE who are at all concerned in agriculture are more or less informed of the keen interest manifested in the practical utilization of tractors that are primarily designed for farm work, but few have any idea of the wonderful development of the industry within the past year. The series of exhibitions that were begun in July in Dallas, Tex., and were continued for eight successive weeks at Hutchinson, Kan.; St. Louis, Mo.; Fremont, Neb.; Cedar Rapids, Ia.; Burlington, Ill.; Indianapolis, Ind., and Madison, Wis., organized by the national association of tractor and implement manufacturers under the name of the National Farm Tractor Demonstrations, attracted the attention of hundreds of thousands and directly resulted in the sale of thousands of machines.

But this was only preliminary to exhibitions made by manufacturers and sales representatives at country fairs all over the country, and since then a considerable number of demonstrations, organized by associations more or less concerned in agriculture, has been made. No exact record of these exhibits exists, but from the extreme Southwest and West to Canada these shows have taken place. These have not been competitive in any sense, but have been operating trials, a number of tractors naturally interesting a larger number and affording those witnessing them far better ideas of the possibilities for work than could be obtained in any other manner. Besides this direct display of tractors many of the machinery and implement

manufacturers and sales agents have joined with the exhibitors in showing the latest improved tools, many of which have been developed for use with tractor power.

Some tractor manufacturers have had demonstrations of sufficient importance to attract thousands. The International Harvester Company, for instance, has organized a number in different sections of the country, informing the people by advertising and by mail, and doing work that could be illustrated with conditions that existed. One of these was at

Dubuque, Ia., which continued for several days, and the six machines were seen in operation by thousands. The company took advantage of these displays to assemble its agents and educate them so that they would be better qualified to sell the machines and to advise those whom they met in a business way.

In contrast with this selling campaign may be instanced the policy of the Lenox Motor Car Company, Boston, Mass., which has begun to build a tractor, and this concern has made several demonstrations of a single machine in a suburb, Hyde Park, although there are those who might wonder who would be attracted to it in Boston. Yet the exhibitions were largely attended and much interest was evidenced.

In Canada, at Whitby, near Toronto, the Provincial Plowmen's Association organized a demonstration that continued for several days and which was participated in by a considerable number of manufacturers from the United States, and among them was a representative from Henry Ford & Son. Statement was made that a price would be established and this tractor would be sold commercially beginning next spring. Out in Oklahoma City, at the convention of the Ozark Trail Association, there was a demonstration of tractors in connection with exhibitions of road building, which was another manner of education the tractor manufacturers have taken kindly to.

Next year there will be a circuit of demonstrations similar to that of 1916, which will be inaugurated at Plainville, Tex., and already the Chamber of Commerce of that city has organized and is making ready for the exhibition that will take place in July, 1917.

This all applies to exploiting the machines that are produced commercially, but this interest is stimulating companies and individuals building power vehicles to tractor production. Statement is made, based on excellent information, that a considerable number of new machines will be ready for the mar-



Plowing with a Moline-Universal Tractor, Showing the Work That Can Be Done with Normal Cultivating Conditions.

ket by the time the agricultural operations will be begun, and besides these, a much larger number of concerns now actively manufacturing are experimenting and developing tractors. There is every reason to believe that in a comparatively short time the farm tractor will be very largely increased, so far as number of manufacturers are concerned, but there is equally good ground for belief that there will be a considerable period of experiment before what can be regarded as a commonly accepted design is produced.

#### TRACTOR ENGINEERS TO JOIN STANDARDIZING MOVEMENT.

The movement to consolidate in one organization all the different societies that are identified with internal combustion engineering as a means of further standardizing practises and parts, is rapidly gaining headway, and there is expectation that before another year passes the engineers engaged in motor

Aside from the economies to be effected by the plan, both to the organizations and manufacturers, it is looked upon as the best way to bring about the quickest possible proper engineering development of tractors, and will strengthen all the industries allied with the movement against any contingencies that might arise in the foreign trade situation when the European war comes to a close.

A division of the standards committee will develop the tractor standards. The standards committee is composed of a number of divisions which report directly to it in the first instance. When reports recommending standards are approved by the standards committee, they are submitted to the council for perusal prior to being considered at the meeting of the whole society for submission to letter ballot on adoption.

Many millions of dollars have been saved by the standardization work that has been accomplished in the automobile industry and a similar saving should be effected in the other industries where

The machine shop and assembly floor is 800 by 100 feet; the casting and milling room 200 by 80 feet; the foundry 360 by 180 feet; the boiler room 45 by 48 feet; the cupola room and charging floor 60 by 60 feet; the core room 60 by 120 feet; the sand and flux storage bins 36½ by 150 feet; the coke storage bin 36½ by 75 feet; the transformer room 18 by 24 feet; the wash and locker room 40 by 100 feet. The buildings are all one story in height with the exception of the pattern vault and are of brick, concrete, glass and steel construction.

By special arrangements of the machinery the raw material enters at one section of the factory and is worked up into finished tractors, which are shipped from another section.

#### LACROSSE TRACTOR COMPANY.

The LaCrosse Tractor Company has been organized under the laws of Delaware with capital of \$1,500,000, of which \$500,000 is preferred and \$1,000,000 is common stock. The new concern was formed by the stockholders of the Sta-Rite Engine Company of LaCrosse, Wis., which had capital of \$200,000 and manufactured gasoline engines. About a year ago the company began work in developing a tractor which will be made by the LaCrosse Tractor Company. L. F. Easton, J. M. Hixon, L. Hirshheimer and L. C. Colman are the principal stockholders in the company.

#### MONARCH BUYS DORNFIELD.

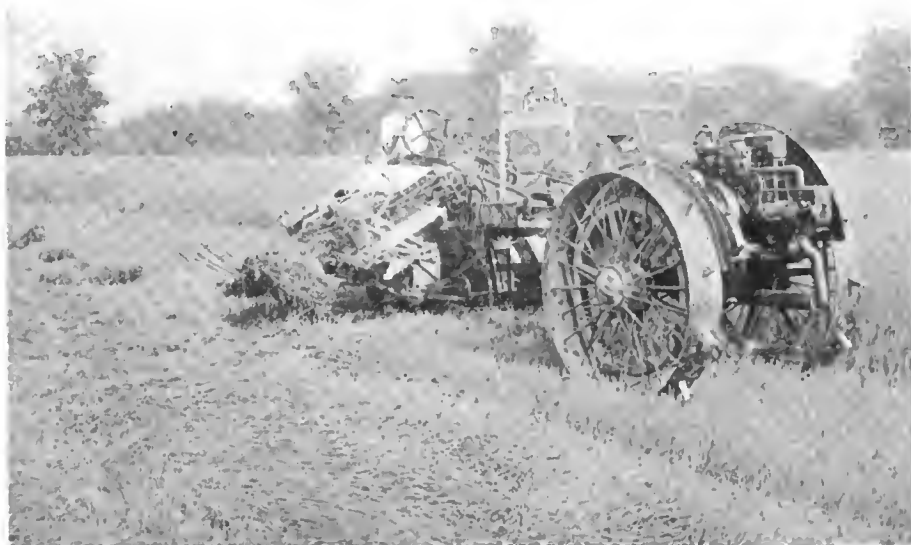
The John Dornfield Iron Works at Watertown, Wis., has been purchased by the Monarch Tractor Company of Chicago, Ill. The Monarch Tractor Company, which is a new concern with capitalization of \$250,000, will manufacture a tractor which, statement is made, is to be known as the "Never-Slip." It is understood that the company already has orders for \$400,000 worth of machines booked. The tractors will vary in power from six to 50 horsepower.

#### LARGE INCREASE OF CAPITAL.

The capital stock of B. F. Avery & Sons, Inc., Louisville, Ky., manufacturer of a tractor known as the Louisville "Motor Plow," which is designed especially for agricultural purposes, has been increased from \$1,500,000 to \$2,300,000. These additional resources are necessary because of the development of the business throughout the country.

#### WILL BUILD FARM TRACTOR.

J. W. Aulson & Sons, a Salem, Mass., concern that manufactures tannery machinery, has begun the manufacture of a farm tractor at its western shop at Waukegan, Ill., which is stated to be an improvement on machines now sold and which will be produced in considerable numbers if it is as practical in service as it has been found to be in experimental work.



Reaping with a Moline-Universal Tractor, Another of the Practical Farming Operations with These Machines.

car, aeronautic, tractor, marine and stationary internal combustion engineering will have become allied under and possibly amalgamated into one organization.

Members of the aeronautic and motor boat engineering societies have already decided to consolidate with the S. A. E., and it is expected that the tractor engineers will also join in the consolidation, while efforts will be made to bring about similar action by the American Society of Agricultural Engineers and the National Gas Engine Association.

With the consolidation of all these different societies which are engaged in a generally similar work, it has been proposed that the name of the combined organization shall be the "Society of Automotive Engineers," which would be comprehensive in its meaning and would cover the varied channels of endeavor represented by the members. Each one of the different branches would be represented on the board of governors by vice presidents.

the gasoline or internal combustion engine is the basis of the product. The value of such standardization to the tractor manufacturers and the buying public would be enormous, as this industry has promise of becoming as extensive as that producing automobiles is at present. The Society of Tractor Engineers, which has headquarters at Minneapolis, has appointed a committee which is now considering the matter of consolidating with the S. A. E.

#### MAMMOTH NEW PLANT TO BUILD MOLINE TRACTORS.

The Moline Plow Company, Moline, Ill., has just completed a new plant for the manufacture of the Moline Universal tractors which it is claimed is the largest tractor factory in the world.

It has 5½ acres of floor space and the contract that was let for the roofing was the largest placed during the past year for one firm.

## PALMER-MOORE 2000 AND 4000-POUND TRUCKS.

**C**ONTINUING its manufacturing policy of building but two sizes or load capacities of trucks, the Palmer-Moore Company, Syracuse, N. Y., has announced that for the year to come it will produce machines with ratings of 2000 and 4000 pounds each. These have been designated as models M and O respectively, the former being practically the same as built throughout 1916, and the latter succeeds the model K 1500 pound truck, which has not been continued.

No manufacturer adheres to a standard design more closely than the Palmer-Moore company, for there is comparatively little difference in the two chassis, the most evident variance being that the engine of the model M is cooled by a thermo-syphon circulation of water, and the model O engine is cooled by a forced circulation. In all other essential details the chassis are alike save in the proportion of the parts, the model O being generally larger throughout.

The Palmer-Moore company does not build what may be regarded as a cheap truck, but does produce what is claimed to be an exceptionally efficient machine. First of all the constructional units are the best that can be obtained from the specialists of the industry, who have developed types with extreme care and have sought to obtain high operating economy and long endurance. These are standard products, the merit of which is understood by all who have to do with automobile vehicles, and they have been adapted with a view of affording the greatest possible accessibility.

Statement is made that a large measure of neglect of truck mechanism is due to the labor necessary in making adjustments, because those responsible for maintenance will not do what entails considerable work, especially if the attention is in addition to the service ordinarily required of the drivers. This is not a reflection upon drivers as a class, but is pointed out as the reason why the designing of Palmer-Moore trucks has been with the purpose of minimizing the work of those who operate and maintain them as the best insurance that they will be so maintained that the operating efficiency will be high and the expense correspondingly small.

Another quality specially sought is body suspension, so that the mechanism of the trucks will be protected so far as is possible from road shocks and vibratory stresses, because easy riding means that not only can fragile freights be carried safely, but the life of the tires can be greatly prolonged, and tire cost is a considerable part of operating expense.

### The Engines Are Buda Construction.

For the purpose of description the model O chassis has been chosen, as this is the most recent construction, but, as has been stated, it differs very slightly from the model M, and principally in proportions. The engine is a model OM—3 Buda—a four-cylinder, four-cycle, water cooled, L head type, with cylinder bore of  $4\frac{1}{2}$  inches and stroke of  $5\frac{1}{2}$  inches, that is rated at 27.23 horsepower by the S. A. E. formula. The maker claims for this engine a maximum horsepower production of approximately 40.

The engine cylinders are cast en bloc with the water jackets integral, the water jacket head being a large plate that carries the water outlet manifold. Much care is taken to have the water passages free and uniform to insure a thorough circulation. The intake manifold is cast with the engine block and is so formed that the inbausted gas is heated by the temperature of the water jacket. The water inlet is so located that the water is first circulated about the valve chambers.

The crank case is an aluminum alloy casting in two sections, the upper being divided by a central vertical transverse web that carries the centre main bearing. The lower

section forms the oil reservoir. By removing the lower section the main and connecting rod bearings can be reached for work or inspection. There is a short forward extension of the upper section that houses the timing gearset. The supporting arms are cast integral with the upper section at the rear end. The pistons are cast from the same grade metal as the cylinders and are channeled for four compression rings above the wristpins and have three oil grooves each.

### General Construction Details.

Much care is taken in casting and machining the cylinder blocks, which are twice tested under water pressure, and the pistons are carefully fitted and balanced. The crankshaft is a steel drop forging that is heat treated, machined and perfectly balanced on a special machine. The main bearing journals and crank pins are ground. The flywheel flange is formed integral with the shaft. The crankshaft has tensile strength of 120,000 pounds to the square inch and the elastic limit is 85,000 pounds the square inch. The camshaft is a steel drop forging with the cams integral, that is machined and ground on a special machine and case hardened. The timing gear flange is integral with the shaft. The cams are exceptionally large. This shaft has three journals.

The connecting rods are I section steel drop forgings that are heat treated, machined, reamed and carefully balanced. The three main and the connecting rod big end bearings are nickel babbitt mounted in bronze shells. The connecting rod



Model O, Load Capacity 4000 Pounds, the Latest Palmer-Moore Truck, Equipped with a Standard Type Express Body.

bearings are shimmed and the end caps are each retained by four special steel bolts. The wrist pins are hardened steel tube and are clamped in the piston bosses, the small ends of the connecting rods, bushed with phosphor bronze, oscillating on the pins.

The valves are made with nickel steel heads electrically welded to carbon steel stems and operate in long guides. The valve tappets are a mushroom type that are fitted with adjusting screws and lock nuts and are mounted in removable guides. The valve mechanism is enclosed by cover plates retained by studs and nuts. The timing gearset is made up of four gears that are helical cut and operate noiselessly.

### Cooling and Lubricating Systems.

The engine is cooled by a circulation of water forced by a centrifugal pump through the cylinder jackets and a large radiator, with cast top and bottom tanks and seamless belical tube cooling sections, that is installed back of the engine and is incorporated with the dash. The radiator is spring mounted. The draft of air through it is caused by the suction of the revolving flywheel, and no fan is necessary. The engine is lubricated by oil forced by a plunger pump through tube to the main bearings and timing gearset, and to the oil troughs into which the big ends of the connecting rods sweep, the splash lubricating the cylinders, pistons, wrist pins, camshaft bearings, cams and valve tappets. The overflow drains to the reservoir and is filtered. By loosening four bolts the oil pump can be removed from the outside of the engine. The



oil flows through a sight gauge and there is an oil level indicator. The oil reservoir capacity is eight quarts. The ignition current is supplied by a high-tension magneto having automatic spark advance, and the fuel is fed by a Zenith carburetor.



Palmer-Moore Truck Engine with the Bonnet Removed, Showing the Extreme Accessibility from the Sides and Front.

The engine is fitted with an automatic governor that is controlled by the velocity of the inhaled fuel. The power plant is combined with a Borg & Beck multiple disc clutch having discs 12 inches diameter, and the unit is mounted on three points.

There are two universal joints in the shaft between the clutch and the transmission gearset which is suspended from cross members of the frame. The gearset is a Covert selective type that has three forward speed ratios and reverse. The shafts are large and the gears are nickel steel, with  $1\frac{1}{4}$  inch faces. The shafts are mounted on Hyatt roller bearings. The drive from the gearset is through a  $2\frac{1}{2}$ -inch tubular shaft to an internal gear axle, this being a type in which the jackshaft is mounted ahead of the round section load carrying axle. The axle beam carries the load and the jackshaft and the pinions and internal gears transmit the power to the road wheels. The axle is fitted with Bower roller bearings throughout.

#### Some Details of the Chassis.

The front axle is a Sheldon product, a drop forged I section, with heavy spindles, fitted with Bower roller bearings. The steering knuckles are equipped with ball thrust bearings. The frame is a pressed steel channel section  $7\frac{3}{32}$  inch thick,  $5\frac{9}{16}$  inches deep, with three-inch webs, that is "necked" from 38 to  $34\frac{1}{4}$  inches width at the forward end. The frame is 212 inches length. It is strongly reinforced and the end and cross members are gusseted.

The frame is mounted on semi-elliptic springs, the forward set being 40 inches long and  $2\frac{1}{2}$  inches wide, and having nine leaves. The rear set is 50 inches long and  $2\frac{1}{2}$  inches wide, having 11 leaves. The front hangers of the rear springs are designed to take driving thrust and prevent breakage of the spring eyes. These are adjustable to minimize pressure and wear on the spring bolts. By reference to an illustration one will note a feature of the rear spring suspension, in a straight three-leaf spring mounted under the rear axle and shackled to the spring hanger and the rear shackle. One will understand that the main spring remains at its load line until deflected and then the deflection continues to a point where it is taken up and resisted by the straight underslung spring, the resistance compensating the deflection, and the reflexion of the main spring beyond the normal straight position of the lower or auxiliary spring is similarly resisted.

The body "end throw" is so compensated that pneumatic tires are not necessary, even on the lightest machine. The influence upon tires is to greatly lessen the wear and to in-

sure much greater mileage. The auxiliary springs also take the load when there is maximum stress on the main springs. The wheelbase of the truck may be either 140 or 160 inches and the tread is standard. The wheels are wood, artillery type, with 14 spokes two inches square, and they are equipped with 34 by four-inch tires forward and 34 by six-inch rear.

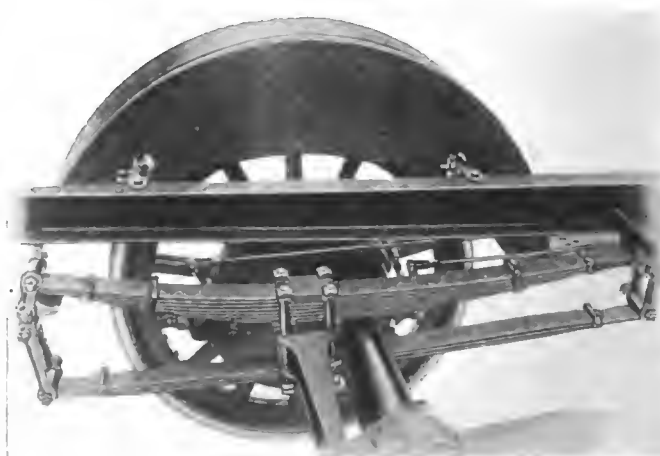
The Ross steering gear is a worm and nut type with 18-inch hand wheel and is at the left side. The control is by foot pedals for the clutch and service brake and hand throttle lever on the steering column, with the emergency brake and gear shifting levers in the centre. The speed of the truck is 15 miles an hour at 1175 revolutions a minute of the engine. The service brake is external contracting on 18-inch drums  $2\frac{1}{2}$  inches wide on the rear wheels, and the emergency brake is internal expanding in the same drums, the shoes being  $17\frac{1}{4}$  inches diameter and  $4\frac{1}{4}$  inches wide. Both brakes are equalized.

#### Model M Chassis is Smaller.

The model M chassis has an engine with cylinder bore of  $3\frac{1}{2}$  inches and stroke of  $5\frac{1}{2}$  inches, and a horsepower of 19.6 by the S. A. E. formula. The cooling is by thermo-siphon circulation. The engine is governed to 20 miles an hour at 1400 revolutions. The wheelbase is 126 inches and the wheels are shod with 34 by three-inch tires forward and 34 by four-inch tires rear. Much care has been taken to insure lubrication of all wearing parts and bushings are provided so that restoration is practical and economical.

One of the qualities is extreme accessibility. By lifting the hood the front and both sides of the engine are reached quickly and without obstruction. By taking out the four bolts of the engine support the timing gearset case is accessible. The clutch and transmission gearset can be inspected without even removing the floorboards, and the gearset is designed to have the cover plate removable from the side, so that the case may be filled or the gears examined without getting under the chassis or raising the floor. The flywheel marking are seen and the clutch reached for adjustments by removing a plate in the toeboard. The spark control is automatic and with the radiator fully protected there is little probability of accidental damage. But the radiator cooling sections are interchangeable and can be quickly replaced should there be need. In the event of radiator damage the helical seamless tube construction minimizes repair expense. Claim is made that while every care has been taken to protect parts against probable wear or being damaged, accessibility means that in the event of repairs being necessary the cost of labor and the idle time of the machine is greatly reduced as compared with other constructions.

The chassis are equipped with open express, stake (both with or without driver's cabs), express with full top and full panel bodies. The standard loading space of the model O



The Underslung Auxiliary Spring That Practically Absorbs All End Throw of Palmer-Moore Bodies from Road Shock.

truck is 132 by 56 inches, and of the model M truck 108 by 46 inches. The chassis are sold with running boards, front mudguards, side and storm curtains for all cabs or tops, oil side and tail lamps, horns and tool kits.



### SPECIAL PAPERS FOR S. A. E. WINTER MEETING.

The papers to be presented at the winter meeting of the S. A. E. at the one-day professional session on Jan. 11, during the week of the National Automobile Show in New York City, will include several subjects other than strictly automobile topics.

Arrangements for the papers discussion are being made by K. W. Zimmer-schied, chairman of the papers committee. Subjects of interest to airplane, tractor and marine engineers will be presented. The paper on airplanes with special relation to engines will be presented by Capt. Virginus E. Clark, U. S. A., and will deal with the experiences of the army aviators on the Mexican border. It is also expected that the foreign airplane engine, which is being produced commercially in this country, will be described. Engines for farm tractors will be discussed by a well known engineer identified with that industry, and a paper will be read on motor trucks with reference to the proposed military specifications now being considered by the Truck Standards Division of the S. A. E. Standards Committee and a specially appointed board of the War Department.

A variety of other papers will be presented by experts, among which, it is anticipated, there will be considerations of pleasure car spring suspension, electrical equipment of gasoline cars, high-speed automobile engines, dynamics of the automobile and crankshaft balance. Only brief digests of the papers will be given by the authors, in order to provide ample time for lengthy discussions of the more important ones.

### LIGHT PLANT ON TRUCK.

The Motion Picture Electric and Equipment Corporation of California has a unique place in the industrial world, as manufacturer of illumination effects for moving picture concerns. The company has a "moving power house," as its apparatus is known, this being a 6½-ton motor truck equipped with generator, gas engine, switchboard and other fittings necessary for the work. The total weight of the outfit, including truck, is over nine tons, but it is moved anywhere to illuminate exterior night scenes, caves, shipboard interiors, railroad cars, halls and theatre interiors.

### BENEFIT OF GOOD ROADS.

That unimproved roads through country sections cause an economic waste is proven by a bulletin recently issued by the Department of Agriculture under the title, "Economic Surveys of County Highway Improvement."

The bulletin gives the results of studies made by government experts in eight selected counties and shows that improved roads increase land values from one to three times the cost of the improvements; cut hauling costs in half and enabled 10 more children in each 100 to receive an education.

### PREVENTING HIGHWAY DAMAGE BY TRACTORS.

The highway authorities in many states are investigating the effect of tractor traffic over the improved highways and in a number of states laws have already been enacted imposing fines upon owners of tractors that damage the surface of roads controlled by the state. Recently a fine of \$15 was imposed upon a Californian for damaging a highway in that state with his tractor, and Pennsylvania highway officials prosecuted two owners of tractors for the same reason.

In some states a fine of \$5 is imposed for tractor road damage, but the authorities consider this penalty insufficient to discourage the use of tractors in the roads. The damage to highways usually results from the devices attached to the tractor wheels to insure good traction, but most manufacturers build the machines so that the cleats or spikes can be removed from the wheels and the surfaces of the roads improved rather than being damaged. It is common practice in England to require tractor owners to secure a permit before operating their machines on the public roads.

### DEAN ELECTED PRESIDENT.

At the annual meeting of the American Road Builders' Association, held in New York City, Nov. 3, Arthur W. Dean, chief engineer of the Massachusetts Highway Commission, was elected president of the organization.

William H. Connel, chief of the bureau of highways of Philadelphia, was elected first vice president; Austin B. Fletcher, state highway engineer of California, second vice president; L. L. Powers, editor of Good Roads, secretary, and W. W. Crosby of Baltimore, treasurer.

Maxmillian Giotin, mechanical engineer of the Imperial Russian railways, who is on a visit to this country to study highway construction, was the principal speaker at the meeting. The other speakers were: Col. Edwin A. Stevens, state road commissioner of New Jersey; Edwin Duffey, New York state commissioner of highways; Frank Q. Brown, chairman of the good roads committee of the Automobile Club of America, and Alfred Reeves of the National Automobile Chamber of Commerce.

### TEST REGISTRATION LAW.

Charles Thaddeus Terry and Ex-Governor Griggs of New Jersey, leading counsel for the National Automobile Chamber of Commerce, recently argued an automobile license case before the Supreme Court of the United States at Washington. This case has to do with the constitutionality of state registration laws and is to decide whether the states have the right to raise funds for good roads under the guise of registration fees, and if they can interfere with interstate traffic and require registration of a motor vehicle which has already been registered as required by the registration laws of the owner's home state.

### GARFORD TRUCKS IN RUSSIA.

J. E. Stuerwald of New York, special representative of the Garford Motor Truck Company of Lima, O., has just returned from a year's absence in Europe, during which period he spent considerable time in Russia.

"A big percentage of the first shipment of Garford trucks in 1914 are still in active service," he said. "There are 30 of them armored and equipped with rapid fire machine guns at Odessa, Moscow, Petrograd and Riga. The second shipment of 240 Garfords went to the department in charge of the Red Cross and ambulance service at the various fronts. Another shipment of 210 Garfords, equipped with transport bodies, is at the Rive front.

### GRAVES JOINS RUSSEL.

Harry S. Graves, formerly with the General Motors Company, has been appointed sales engineer of the Russel Motor Axle Company of North Detroit,



Harry S. Graves, Sales Engineer,  
Russel Motor Axle Company.

Mich. Mr. Graves has been identified with the automobile industry for more than 10 years, during which time he has been connected with several of the largest manufacturers in the country.

### TROJANS WANT AUTO ENGINE.

The residents on the East Side of the city of Troy, N. Y., have signed a petition which is to be presented to the Public Safety Department, urging the purchase of a new auto chemical engine for the Farnam Steamer Company. The Highland Community Association is behind the movement.

### PEERLESS HEAVY EARNINGS.

The earnings of the Peerless Motor Car Company for the nine months ending Sept. 30 were \$1,932,259 net, or at the rate of 25 per cent. on the stock. The total gross sales during the period totaled \$10,149,000.

# NOW A \$725

*Internal Gear Drive Makes Solid Tires Practicable. We Recommend Them*



**Complete as Illustrated. Maximum Capacity 1500 Pounds**  
**With Handsomely Finished Express Body, Canopy Top, Side Curtains, Glass Front, Electric Lights with Generator and Battery and Electric Horn**

**M**ODEL 9 Republic Dispatch opens a great new field in the truck market—it is a real truck for every line of light delivery. It has Snap and Style and Finish, adding distinction to the most exclusive business, and it has Power, Speed and Capacity for any business. *On 500-pound loads as well as 1000-pound or 1500-pound loads, Republic Dispatch operates at the lowest cost. Tests of a year prove this.*

The Solid Tire feature is an enormous selling advantage. Solid or Pneumatic Tires are optional but we recommend Solid Tires. With this equipment users can forget tire troubles. Here is new economy.

Twelve thousand of these light delivery jobs

have been scheduled as our output for the coming twelve months.

Delivery to dealers begins in November. Already a large part of this output has been contracted for—and the indications now are that the entire 12,000 will be sold before the year is half over.

The largest advertising campaign ever made on motor trucks has been scheduled by the Republics. It opens with a 2-page advertisement in The Saturday Evening Post, Nov. 4th, and a 2-page spread in Collier's, Nov. 11th. Other national publications are used totaling over six million circulation.

Write for details of our proposition.

ADDRESS DEPARTMENT R.



(When Writing to Advertisers, Please Mention MOTOR TRUCK.)

# REPUBLIC

## New Republic Motor—New Lubrication Armored Type Radiator—Read the Features

Maximum capacity 1500 pounds.

**Motor**—Republic original design. Bore and Stroke,  $3\frac{1}{2} \times 5$ . Cylinder Head, detachable. Four Cylinders, cast in block with barrel crank case. Ball Bearing Crank Shaft,  $2\frac{1}{2}$  inches in diameter. Extra heavy cheeks. Valves,  $1\frac{1}{4}$  inches in diameter. Timing Gears, 1-inch face. Cam Shaft,  $1\frac{1}{4}$  inches diameter. Connecting Rod, 10 inches long from center to center. Fly Wheel, weight 60 pounds; 14-inch diameter, enclosed in bell housing. Governor, Ruggies pneumatic type. Lubrication, circulating oil bath to all moving parts. Oil pump submerged. Ignition, Bosch high tension magneto. Cooling, thermo-siphon. Extra large water passages. Motor Suspension, three point special.

**Radiator**—Republic 'Armored Type'; cast tank, all-brass water-cooling core; extra strong and tough—a real truck radiator, able to withstand torque, road shocks and constant vibration—not a pleasure car cooling system.

**Carburetor**—Using either gasoline or distillate.

**Magneto**—Bosch High Tension.

**Clutch**—8-face Dry Disc 10 in. diameter.

**Transmission**—Selective sliding gear, 3 forward and 1 reverse. Heat treated, case hardened, nickel alloy steel gears with 11-16 face. Hyatt bearings. Center control operating in ball and socket joint.

**Drive**—Through universal joints with  $1\frac{1}{4}$  tubular shaft.

**Front Axle**—Drop forged I-beam. Outside spindle  $\frac{3}{4}$ -inch diameter, bearing has eleven  $\frac{1}{4}$ -inch balls. Inside spindle  $1\frac{1}{4}$  inch diameter, bearing has eleven 11-16 balls.

**Rear Axle**—Republic-Torbenzen Internal Gear. Nickel steel gears. Ratio  $5\frac{1}{2}$  to 1. Entire load carried on drop forged I-beam. Power transmitted through live shafts and internal gears. Inside spindle 1 37-64 diameter. Outside spindle 1 3-16 diameter. Bower roller bearings.

**Service Brakes**—Double acting internal on rear wheels. 14 inches in diameter with 3-inch face.

**Emergency Brake**—On transmission. External contracting.

**Front Springs**—Semi-elliptic,  $36\frac{1}{2}$  inches long x 2 inches wide.

**Rear Springs**—Semi-elliptic, 48 inches long x 2 inches wide.

**Wheels**—Artillery type, twelve  $1\frac{1}{4}$  spokes front, twelve  $1\frac{1}{2}$  spokes rear.

**Tires**—Optional, Firestone Cushion Solid  $32 \times 3$  in. front and  $32 \times 3\frac{1}{2}$  in. rear or Goodrich pneumatic  $32 \times 4$  in. front and rear. Non-Skids rear.

**Steering Gear**—Jacox worm and nut type. Left side drive. 18 in. wheel.

**Frame**—Straight Taper  $25\frac{1}{2}$  inches front to  $38\frac{1}{2}$  inches rear. Pressed steel channel section, 161 inches long 4 inches deep, 2 inches wide, 3-16 material.

**Wheelbase**—110 inches—Tread 56 inches.

**Weight**—2380 lbs., with standard equipment.

**Gasoline capacity**— $8\frac{1}{2}$ -gallon gasoline tank located in cowl. Gravity feed.

**Bodies**—Express with canopy top, and solid panel.

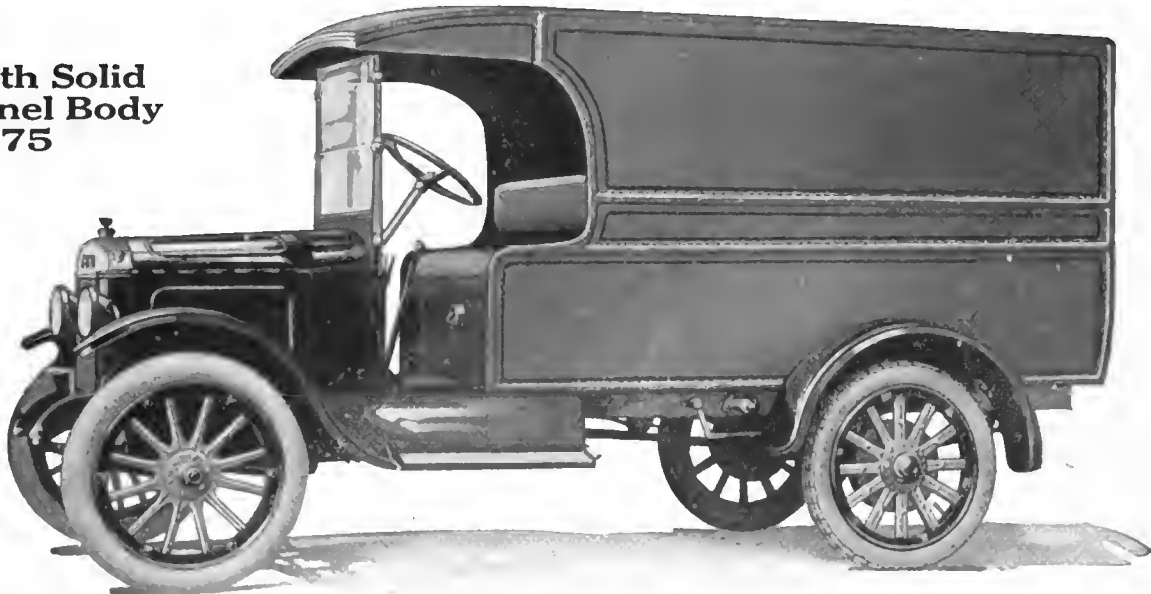
**Body Dimensions inside**—Express body 81 inches long,  $42\frac{1}{2}$  inches wide,  $11\frac{1}{4}$  inches deep. Total body height with canopy top,  $54\frac{1}{2}$  inches. Solid panel body 81 inches long,  $42\frac{1}{2}$  inches wide,  $54\frac{1}{2}$  inches high. \$25 extra.

**Standard colors**—Brewster green, yellow wheels.

**Equipment**—Glass front, electric horn, tool kit, electric head and tail lights.

**Electrical equipment**—Bosch ignition and generator unit with battery is standard equipment. Bosch starter furnished at extra charge.

With Solid  
Panel Body  
\$775



## Two More New Republic Models

These new Republics with the Model "A" two-ton at \$1675, and the Model "T" Dreadnaught at \$2550, make in all five Republic sizes—a Republic for every kind of service—a range of capacity which makes it possible to standardize your customer's entire delivery and hauling service with Republic Trucks. We will build over Twenty Thousand Trucks in the coming year.

We also announce two other models of Republic Internal Gear Drive Trucks—Model 10 One-Ton with Stake or Express Body with Bow Top Included, \$1095, and Model 11 One-and-One-half-Ton Chassis, \$1275.

### UNITED STATES EXPORTED 80,658 MOTOR VEHICLES.

During the 12 months ending June 30, 1916, 80,658 motor vehicles were exported from the United States, with a value of \$100,258,220. According to figures of the Department of Commerce the exports made up 15 per cent. of all the motor vehicles produced in this country in the last year, and 10 per cent. of their value.

Not including the exports to American possessions, the shipments to foreign countries included 21,265 commercial vehicles valued at \$56,805,548, and 56,234 passenger cars, valued at \$40,660,263. Nearly all of the trucks, 19,028, went to England, France and Russia, and the same countries took nearly one-quarter of the passenger cars, buying 13,848 machines. Great Britain and her colonies bought 43 per cent., and France and her colonies about 20 per cent. The Philippine Islands, Alaska, Hawaii and Porto Rico bought 4488 motor vehicles, worth \$3,740,145.

Practically 90 per cent. of all the exports were taken by the following countries: England, France, Russia, Canada, Australia and Tasmania, Cuba, New Zealand, Argentina, British South Africa, British India, Philippines and Dutch East Indies. The shipments, however, went into 78 different countries, including Roumania, Switzerland, Serbia, the Azores, Madagascar, French Africa, Korea, Paraguay, Guianas, Nicaragua, Haiti and the Danish West Indies.

### USE OF MUD-LADEN FLUID.

The Department of the Interior, Bureau of Mines, has issued a bulletin prepared by James O. Lewis and William F. McMurray on the "Use of Mud-Laden Fluid in Oil and Gas Wells" to prevent the waste of gas and oils in mining for those products. It is a comprehensive treatment of the subject, which was taken up in response to protests from various sources regarding the enormous waste in mining and the technical conditions that were responsible for it during the exploitation of the Cushing field in Oklahoma in the winter of 1912-13.

### CONCRETE ROAD SURVEY.

A comprehensive survey of all concrete roads in the United States is being undertaken by the Portland Cement Association, with the object of determining the condition of roads now in use and to confer with local road authorities as to the degree of maintenance or any similar attention that the roads might need. The survey will also furnish data from which a history of the concrete roads may be compiled.

### EATON IS GENERAL MANAGER.

J. O. Eaton, treasurer of the Torbensen Axle Company, was elected general manager of the company at a meeting of the directors held on Oct. 30.

### PIERCE-ARROW TRUCKS SHOW LARGE ECONOMIES.

A fleet of four five-ton Pierce-Arrow trucks has replaced about 20 horses in the service of the Milwaukee Western Fuel Company, Milwaukee, Wis., and the change resulted in far superior delivery service and a saving in delivery costs.

Two years ago the first trucks were put in service and the results led to the purchase of two more and a fifth will soon be added to the fleet. While a mileage of 70 is reached frequently, the average daily mileage for each truck of the fleet is about 60 miles. Through winter and summer the machines have been used without delay and have averaged about four miles to the gallon of gasoline in city and suburban work.

Each truck makes an average of 15 stops a day and the operating cost per truck ranges from \$15 to \$23 a day, according to mileage. The larger expense is usually incurred on days when overtime work is necessary. All the trucks have power holsted bodies, but make very little noise.

On delivery at the Pabst brewery, a distance of three miles, is made 19 times a day in less than six hours, a distance of 57 miles in all being covered and 100 tons being delivered.

### SHIPMENTS BREAK RECORDS.

The National Automobile Chamber of Commerce figures show that during the month of October, 19,510 car loads of automobiles were shipped, with one day's shipments missing, against 1662 over the 17,848 car loads shipped during the corresponding period in 1915. At a meeting of the directors, statement was made that the shortage of freight cars continues in all lines of trade, with railroad terminals congested and many factories experiencing severe loss from lack of cars.

A report was made by the commercial vehicle department on the proposal to supply complete data to the legislators in various states in connection with proposed legislation on the use of motor trucks on highways. These data will enable special commissions, committees and individuals to make recommendations for reasonable laws which will not hamper the growth of the motor truck industry.

Charles Clifton, president of the chamber, was appointed representative of the organization in the Chamber of Commerce of the United States. It was reported at the meeting that all the space for the New York and Chicago automobile shows had been taken and that new applications could only be considered when space was released by those who have already subscribed for it. The following were in attendance at the meeting. Charles Clifton, president; C. O. Hanch, Hugh Chalmers, R. D. Chaplin, William D. Metzger, H. H. Rice, Carl H. Pelton, Windsor T. White, A. L. Riker, R. E. Olds, John N. Willis, Alfred Reeves and S. A. Miles.

### RUSSIAN ARMY TRIALS OF GARFORD TRUCKS.

J. E. Stuerwald of the Garford Motor Truck Company, Lima, O., who has just returned from a business trip in Russia, where he found that the cost of living had risen from 200 to 600 per cent., says that this advance in commodity prices has been due to the lack of proper transportation facilities.

Mr. Stuerwald witnessed an interesting test made under the auspices of the Russian War Department, in which two Garford model 70 trucks of two-ton capacity were used. The trucks were loaded with 2½ tons each and sent out on a 200-mile drive in charge of a driver, one officer and official observer. The road conditions were as poor as they possibly could be and be driven over, and in some cases they were impassable and the machines were of necessity driven through fields. The trucks finished the test to the satisfaction of the officials, but during the trip had broken through three bridges, which had to be reconstructed before the drivers of the trucks could resume their journeys. The Russian War Department is operating several hundred Garford trucks in its service.

### NEW CROSSING WARNINGS.

The Long Island railroad is changing the crossing warnings throughout its system to comply with new standards recommended jointly by the American Railway Association and the Public Service Commission. Notification of this change has been sent out to all drivers of vehicles that use the highways on which these crossings are located. The notices read as follows:

"That all gates are painted with black and white diagonal stripes, and at night these gates will show a red light.

"That the crossing watchmen, during daylight, will hold to view a 16-inch disc with the word 'stop' painted in large black letters on a white field. At night watchmen will use a red lantern to signify the approach of the train."

### AMERICAN AUTOS IN HANKOW.

There is a larger number of American automobiles in Hankow, China, than there are cars made in other countries. Dealing in motor vehicles, however, is not flourishing, owing to the bad road conditions. In January, 1915, according to a recent consular report, there were 28 automobiles registered, while at the end of 1915 there were 44, of which 24 were American makes, seven French, six British and three German.

### NORWALK BUYS AMBULANCE.

A new motor ambulance has been installed in the service of the Norwalk hospital, Norwalk, Conn. It has regulation equipment on a White chassis. The machine cost \$2850, which sum was raised through popular subscription and benefit performances.



## WILSON MODEL E 4000-POUND CAPACITY TRUCK.



Wilson Model Chassis "Head-On," Showing the Mounting of the Lamps and the Bumper Incorporated in the Frame.

**E**XPERIMENTING practically three years before beginning the commercial production of trucks evidences better than any other statement that can be made the policy of the J. C. Willson Company, Detroit, Mich., which is manufacturing a single type machine. The company for years engaged in building vehicle bodies, first for animal and later for power trucks, and it was known as a specialist in this work. When truck manufacturing was considered there was keen realization of the necessity of building machines that would be distinctive in quality, that would have every characteristic to attract and interest those who understand motor truck, that would be proven by practical service and could be guaranteed to afford high efficiency and operating economy.

The initial work preliminary to manufacturing was begun in 1913 and a design was developed that was perfected by Vincent Link, consulting engineer. The machine is built with load capacity of 4000 pounds, but the Wilson company strongly urges the use of semi-trailer equipment, so that used as a tractor a load may be 8000 pounds and well within the recognized factors of safety.

In developing the design experimental machines were worked in conditions that would be regarded as impracticable for economic service. One was driven to Colorado and with full load ascended to the top of the highway up Pikes Peak, this climb being 18 miles, which was a record altitude reached by a truck at that time. The design adopted is regarded as stronger in construction and having greater power than that which climbed Pikes Peak. This design has been standardized and it is now produced as model E.

The engine of the model E truck is a Continental construction, being a four-cylinder, four-cycle, water cooled, L head type, having cylinder bore of  $4\frac{1}{4}$  inches and stroke of  $5\frac{1}{4}$  inches. The rating by the S. A. E. formula is 27.2 horsepower, which will no doubt be considerably exceeded. The engine is governed to obtain 15 miles an hour, which, with the ratio of gear reduction adopted, is obtained at approximately 1050 revolutions a minute. The Continental model C engine

cylinders are cast en bloc from a special grade of gray iron, the base flange being extended and the block webbed at the left side to enclose the valves. The water jacket head is a large plate that is retained by cap screws, this construction insuring the water passages being uniform and free from obstructions. The head plate has a deep channel that extends from the rear to the outlet manifold, this directing the flow of water from the cylinders into the radiator.

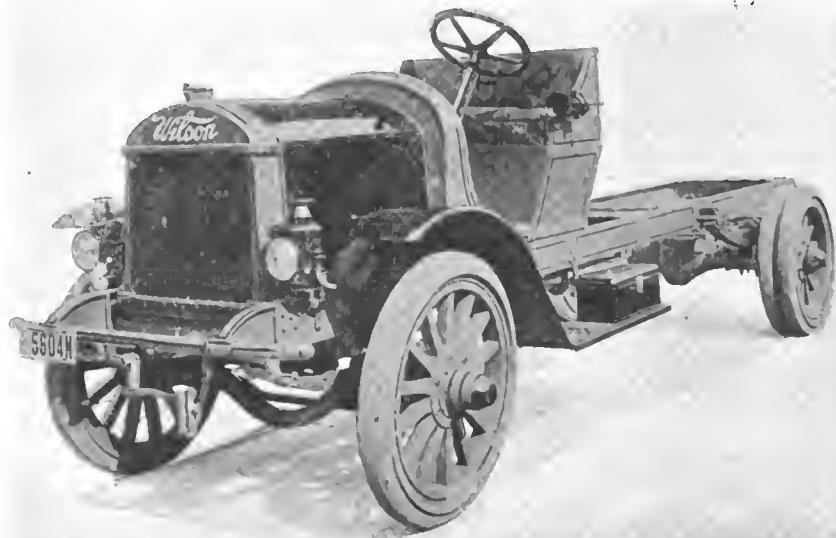
The engine block is tested by water pressure before and after machining to find possible leakage from casting defects. Much care is taken in finishing the block to obtain absolute accuracy of workmanship. The crank case is a nickel aluminum alloy that is cast in two sections, the upper half carrying the main bearings. This is divided by a vertical transverse web that carries the centre main bearing, and there is a forward extension that houses the timing gearset. The lower section forms the oil reservoir and also contains the oil troughs for the splash lubrication. This half can be easily removed to reach the connecting rod and main bearings. The pistons are cast from the same grade of iron and are carefully turned to size. They are channeled for four diagonally split eccentric rings and each has five oil grooves to thoroughly distribute the oil on the cylinder walls. The rings are specially ground and machined and extreme care is taken in fitting them, and the wrist pin holes are bored by special machines to insure accuracy of centres and alignment.

### The Crankshaft and Camshaft.

The crankshaft is a steel drop forging of the three-bearing type with the flywheel flange integral. The journals are  $1\frac{1}{4}$  inches diameter and from front to rear are  $2\frac{3}{4}$ , three and four inches respectively, giving a total bearing length of  $9\frac{1}{4}$  inches. The shaft is flanged to take end thrust from the clutch pressure. The shaft is heat treated to afford a tensile strength of 90,000 pounds to the square inch and the journals and crankpins are carefully ground. The camshaft is also a single-piece drop forging that is carried on three bearings. This is machined, annealed and hardened and ground on a special machine that insures accuracy of the cams. The shaft is so constructed that it may be withdrawn from the crank case by removing the cover of the timing gearset case.

The connecting rods are drop forged I section, bored and reamed to obtain accuracy of centres. The caps are retained by nickel steel bolts that are secured with lock nuts. The wristpins are hardened steel tube and are clamped in the small ends of the connecting rods, the ends oscillating in the bushed bosses of the pistons.

The main and the connecting rod big end bearings are



Quartering View of Wilson Model E Chassis, Displaying the Large Sectional Radiator, the Peculiar Spring Hanger, the Steel Dash and Luxurious Seat.





Rear View of Wilson Model E Chassis, Showing the Sheldon Semi-Floating Worm Drive Axle and the Heavy Frame.

nickel babbitt that are retained by brass screws. The connecting rods are adjusted with steel shims. The camshaft bearings are nickel babbitt. The valves are made with nickel steel heads electrically welded to carbon steel stems, and these operate in long guides. The valve tappets are chrome nickel steel and are a mushroom type, case hardened, and fitted with adjusting screws and lock nuts. The timing gears are helical cut and are practically noiseless in operation.

#### Engine Lubrication and Cooling.

The engine is lubricated by plunger pumps that are driven by an eccentric from the camshaft. The oil is drawn from a screened well in the reservoir and forced through pipe to the rear main bearing and the timing gearset, and drains to the oil troughs in the bottom of the crank case, where it is distributed by splash to the cylinders, pistons, main, connecting rod, wrist pin and camshaft bearings, the cams and valve tappets.

The engine is cooled by a circulation of water forced through the engine jackets by a double-bearing centrifugal pump and a radiator mounted on the forward cross member of the frame. This radiator is built with cast iron top and bottom tanks and a cooling section constructed of finned tube that has a frontal cooling area of 557 square inches. The radiator is assembled with bolts and gaskets and in the event of damage or other need the cooling section can be quickly replaced.

The radiator is not spring mounted, but is supported by a wooden cross member covered with layers of felt and leather that is placed directly above the frame front cross member. The cooling system has a water capacity of 6½ gallons.

The source of ignition current is a high-tension water proof Eisemann magneto with a fixed spark that is attached to the engine case by a quickly detachable clamp. The fuel is supplied through a Marvel carburetor, an automatic float feed type. The engine is equipped with a Pierce centrifugal type governor. The clutch is included in the engine unit, this being a pressed steel leather faced cone 15½ inches diameter with 2½ inch face. The power is transmitted to the gearset by a short shaft with a universal joint at either end.

The transmission gearset is a selective sliding gear type that has three forward speed ratios and reverse. It is a special design and is suspended in the frame from three points, so that it may be free from the effects of chassis distortion and may be quickly removed when necessary. Both the main and countershaft and the gears are nickel steel, heat treated to have great strength, and the shafts are mounted on large Hyatt roller bearings. The

gear ratios are 31.3:1 on low, 14.6:1 on second and 8.6:1 on high, which is direct, and 41:1 in reverse.

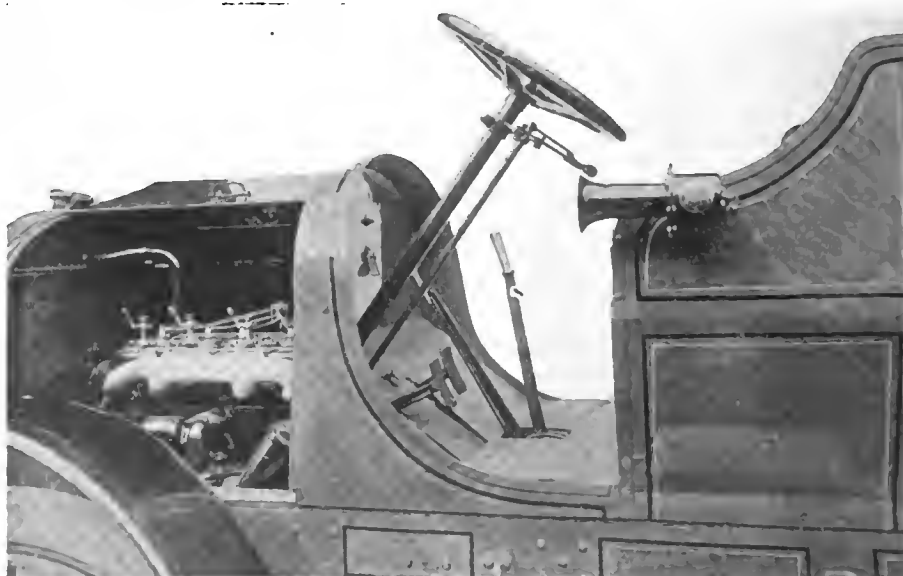
The main driving shaft is 1½ inches diameter, with universal joints at either end, and when loaded the shaft is approximately in a straight line. The rear axle is a Sheldon semi-floating worm and worm wheel construction. The axle housing is a single piece and the worm shaft and the differential gearset are carried on large annular ball bearings. The axle shafts are mounted in large ball bearings in the ends of the axle housing, retained by plates bolted to the housings. The wheels are keyed on the taper ends of the shafts and secured by locked nuts. The front axle is an I section steel drop forging with heavy steering knuckle, fitted with annular ball bearings.

#### The Frame and Other Chassis Details.

The frame is a rolled steel channel section six inches wide, with ample webs, heat treated, with a curved tubular forward guard that is held by the specially designed front spring brackets, this protecting the wheels and radiator. The frame is suspended on semi-elliptic springs, 40 inches long and 2½ inches wide forward and 50 inches long and three inches wide rear. The springs have 10 and 12 leaves respectively. The propulsion is by the Hotchkiss system, through the springs, which absorb both driving thrust and torque. The wheelbase is 144 inches and the tread 53 inches. The wheels are wood, artillery type, equipped with solid tires, 36 by four inches forward and 36 by four inches rear.

The steering gear is at the left side and the control is by foot pedals that operate the clutch and service brake, a throttle lever on the steering wheel and gear shifting and emergency brake levers at the centre. A foot accelerator is regular equipment. The brakes are both internal expanding in drums on the rear wheels, the shoes being 18 inches diameter and 2¼ inches width, with facings of thermoid.

A great deal of attention has been given to perfecting the machine. The angle of inclination of the steering wheel is considerable, the seat and back of the seat are heavily upholstered to afford practically touring car comfort, and a feature is mounting the locomotive type lamps, of heavy pressed steel, on the forward ends of the frame members, so that maximum light is projected on the road and the vibration and probability of damage are minimized. The 20-gallon fuel tank is installed under the driver's seat. The dash is pressed steel. The forward fenders are heavy pressed steel and are short, so that work may be conveniently done on the engine, and the brackets carrying them are unusually heavy. Careful attention has been given to lubrication of all moving parts, and large bronze bushings have been provided that may be easily renewed when worn. The length of the standard chassis is 216 inches and the length of the frame back of the driver's seat is 126 inches. The chassis is sold with the usual equipment for \$2350.



The Conveniently Located Control Members of the Model E Wilson Truck and the Very Accessible Power Plant.

## RECORD ARMY MOVEMENT WITH BIG TRUCK TRAIN.

UNITED STATES army truck train No. 13, which is composed of 31 three-ton Riker trucks, made by the Locomobile Company of America, in command of Captain John A. Pearson, 11th Cavalry, during a

day when much time had to be devoted to road making only three miles was covered, but in one day's run the train made 126 miles. The standard day's travel for a four-mule team is 17 miles, according to the United States army regulations, at which rate it would have taken 47 days to make the trip with mules, exclusive of the four days' loss while en route.

When the train arrived in San Antonio a thorough inspection showed that every truck was in good condition and all were immediately put in regular service in the quarter master general's department. While the most important fact established through the remarkable record made was the superiority of truck train



The Riker Trucks Used for the Long Trip from Columbus, N. M., to San Antonio, Tex., the Actual Time Being 13 Days' Travel.

recent trip from Columbus, N. M., to San Antonio, Tex., made a new record for transportation in the annals of United States army history.

Seventeen days were spent in making the trip, which was more than 800 miles, but the actual running time was 13 days. Four days were spent in laying by, two at El Paso and two on the road. The route traveled was little better than a trail, excepting a stretch of about 30 miles leading into the city of San Antonio. The remainder of the distance was across the desert, over a sun baked, thin layer of soil on bottomless sand, and many times it became necessary for the men to take fire wood from the "chuck" trucks and use it for building temporary roadways over the soft places. Stretches totaling 58 miles had to be covered over these made roads and many long pulls were made through gumbo mud and flooded streams and river beds, in which the water was abnormally high owing to torrential rains.

The trucks not only carried their own supplies of gasoline, water and tools, but also subsistence for the men, as the train was being operated as an independent unit and was not allowed to take on supplies from an outside source.

An average of better than 66 miles a day running time was maintained throughout the trip, which is phenomenal when compared with travel records made by animal supply trains of the army. On one

transport over all other equipment, army authorities were high in their praise of the time made in view of the traveling conditions. What doubts existed regarding the efficiency of the motor truck as an army transport have been based on the belief that where rough going was encountered the machines would fail, but the Riker machines proved that they could be depended on in almost any condition that could be traversed by army mule team trains, and that when they were on fair or good roads they more than made up for losses by making nearly eight times the speed that could be maintained by the mules, and keeping this rate as long as they were driven. In fact, the only limitation is the physical endurance of the men, and as they are but little wearied at the end of a day's ride as compared with "hiking" along a trail and carrying their equipment, they can travel much longer each day.



Part of the Riker Truck Train Crossing the Desert Where the Trail Is Merely a Path and Follows the Line of Least Resistance.

## MODEL NO. 9, REPUBLIC 1500-POUND TRUCK.



Model No. 9, Republic Dispatch Chassis. Equipped with Express Body with Standing Four-Post Canopy.

**T**HREE new sizes or models of trucks will be built for the coming year by the Republic Motor Truck Company, Alma, Mich., which concern has planned to manufacture 23,000 machines of all types. The series of Republic trucks now includes vehicles of 1500, 2000, 3000, 4000 and 6000 pounds load capacity, and they are so far as possible in one design, although they differ from each other in some general details.

The initial policy of the Republic company was to manufacture a single standardized type, but the demand for machines of larger or smaller capacity from those who were desirous of Republic construction and service became so insistent, and the requirements of business men are so variable, that the company built other sizes, and now with the 1917 series there is reason to believe that the needs of practically 85 per cent. of those requiring highway haulage can be met.

Chief interest centres in the 1500-pound machine, which is known as model No. 9, Republic Dispatch, the first deliveries of which were begun this month. The company states that this vehicle represents the best progression of the industry and it is real truck construction in every respect. The chassis, with solid panel body, is sold for \$775, and this includes an unusually complete equipment. The chassis has an electric lighting system, and an electric engine starter can be supplied at a very small additional price.

The manufacturing plan requires the production of 12,000 of these trucks, and statement is made by the company that a large number of its 542 sales representa-

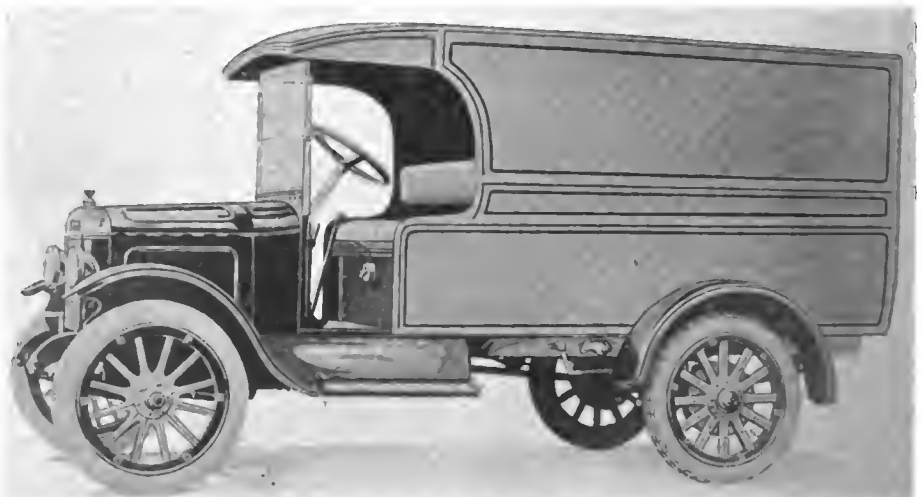
tives throughout the country, who have seen machines at the factory, are very enthusiastic of its market possibilities. While this may appear to be a very large number of a single type, the output has been based on actual knowledge of the demand for machines of this capacity, and there is belief that the market will absorb all of them, especially when the seemingly low price is considered.

Statement is made by the company that the development of this machine covered a period of more than a year, during which time it was tested for carrying capacity,

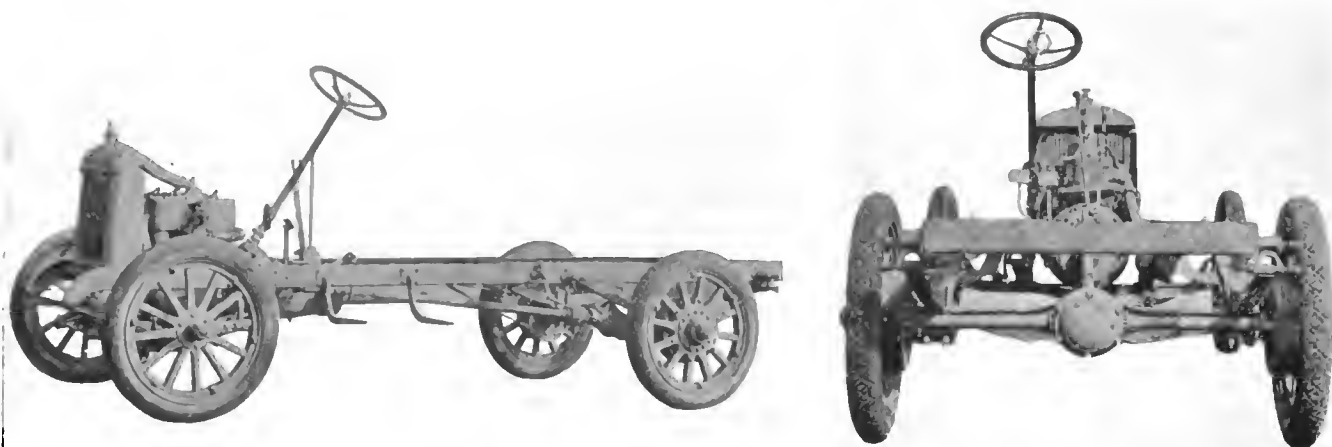
power and speed, and it was found to be extremely economical. The company makes very broad claims for efficiency and economy of this truck, maintaining that it may be operated at minimum cost with 500 and 1000 pound loads, as well as when worked to full load capacity.

### First Machine Making Long Trip.

The first model No. 9 machine sent out from the factory was started Oct. 5 for an overland trip to Los Angeles, being driven by Lester Poyer, son of D. F. Poyer, Los Angeles distributor of Republic trucks, who was accompanied by H. L. Dewey, factory representative. The route planned for the trip is approximately 3760 miles and the intention was for the crew to visit more than 50 different Republic distributors, so that many detours of varying length will be made from what would be a reasonably direct highway. In some of the cities stops from two to three days will be made, and while a mileage of 200 has been made in one day, the machine is not expected to reach its destination



Full Panel Body, One of the Standard Equipments of the Model No. 9 Republic Dispatch Chassis.



The Model No. 9 Republic Chassis: At Left, the Complete Stripped Machine; at Right, a Rear View, Showing the Torbensen Drive Internal Gear Axle.

until about Dec. 10. Daily reports are made the company and a record of the expense and work—a full load is carried—will be made public later on. The departure of the truck and its crew was the occasion of a gala day at Alma, the factory employees, with the factory band, assembling to witness the leaving.

The statement that the model No. 9 Republic chassis represents careful truck design is well founded, there being unusual factors of safety in every component, the engine is specially developed for this machine, and the axles are considerably larger than is the average for vehicles of similar capacity. The weight has been minimized by careful proportioning, however, for the chassis, fully equipped with express body, canopy top, glass front, electric lights and electric horn with generator and storage battery, weighs but 2380 pounds.

#### Engine an Exclusive Design.

The engine is exclusively a Republic design and statement is made that it is a result of five years experimental work to produce a satisfactory light truck power plant. It is constructed entirely at the Republic factory and a large department has been organized and equipped to produce it. Claim is made by the company that the engine is remarkably economical of fuel and lubricant and its operating cost is extremely low. The engine is exceedingly simplified and the

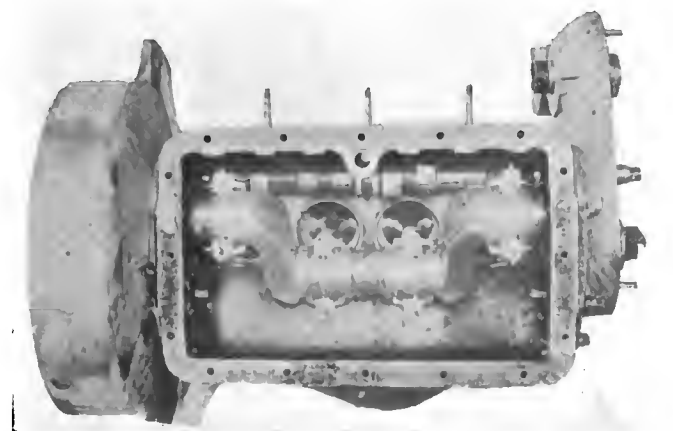
number of the parts has been considerably reduced, in some instances by combining with the cylinder block what in other engines are special fittings.

The engine is four-cylinder, four-cycle, water cooled, L head, vertical type, the cylinders and crank case being cast integral. The form of the engine block is practically rectangular, and it is much shorter than the average construction. The design of the crank case is with reference to obtaining great strength and the casting is seemingly of unusual height for its length. It is cast with separate head and oil pan, with a forward extension of the block to form the timing gear housing. The water jackets are integral and these are very large to insure a sufficient volume in the cooling system. The water inlet manifold is at the forward end at the left side. The water jacketed cylinder block head is a separate casting that is retained by 12 studs, one of which secures the water outlet manifold in the centre.

#### Has Patent Intake Manifold.

The intake manifold is a peculiar design, for which patents are now pending, and this is incorporated in part with the cylinder block. The valves are at the right side of the engine, but the carburetor is installed at the left side, the fuel passing through the manifold being warmed by the temperature of the water jacket. The design of the engine requires exceptional foundry work. The exhaust manifold is large and is so constructed that very thorough scavenging of the cylinders is obtained. The engine block is so cast that machining is minimized and yet a very clean and simple casting is practical.

The crankshaft is an exceptionally heavy steel drop forging. It is a two-bearing type, which is unusual in truck construction, is  $2\frac{1}{8}$  inches diameter at the bearings and crank pins, and is very short, with exceedingly heavy webs or cheeks. The reader may note from illustrations that the form and proportions of the crankshaft are not conventional, and while the crank pins are very long the distance between the main bearings is comparatively short. Because of the design the crankshaft will not "whip" under heavy load stresses. The crankshaft, as will be seen by reference to illustra-



Republic Dispatch Engine with Oil Pan Removed, and the Simplified Construction Plainly Shown.

tions, is mounted on a pair of extremely large ball bearings. With adequate lubrication these bearings ought to endure for a very long period of time.

#### **Pistons Are a Two-Ring Type.**

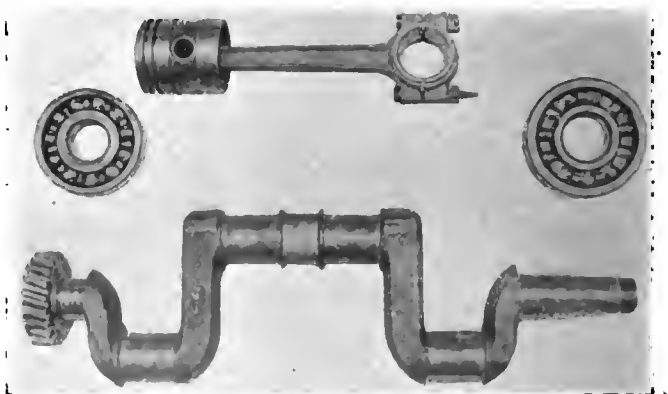
The pistons are a two-ring type with a wide oil recess extending either side of the bore for the wrist pins. The connecting rods are made with very wide big end bearings, that are each retained by two large bolts and castellated nuts. These are adjustable with shims and can be conveniently reached by removal of the lower section of the crank case. As will be seen by examination of the illustrations the tubular wrist pins are clamped in the small ends of the connecting rods and oscillate in large bushings in the piston bosses. By the use of high grade metal and good designing the reciprocating parts of the engine are very light without sacrificing strength.

The camshaft is a single piece drop forging  $1\frac{3}{4}$  inches diameter, and this is carried in two long bearings. It is constructed with very wide cams and is designed to endure hard service. The timing gears are helical cut and operate practically without noise, and the faces are one inch width. The valves operate in long guides, and the mushroom type valve tappets are fitted with adjusting screws and lock nuts and are installed in substantial guides. The valves are enclosed and thoroughly protected, the cover plate being fitted with a gasket and retained securely by two nuts.

The bore of the cylinders is  $3\frac{1}{4}$  inches and the stroke five inches, and the engine has a rating of 16.9 horsepower by the S. A. E. formula; but with the long stroke the bore to stroke ratio being 1:1.65, the claim that 25 horsepower will be developed is very conservative.

#### **The Cooling and Lubricating Systems.**

The engine is cooled by a thermo-syphon circulation of water through the jackets and a radiator that is known as a Republic "armored type," this radiator being a sectional construction with cast head and bottom tanks and a brass cooling section. Part of the head tank is finned, which insures strength with comparatively light metal and promotes radiation. The



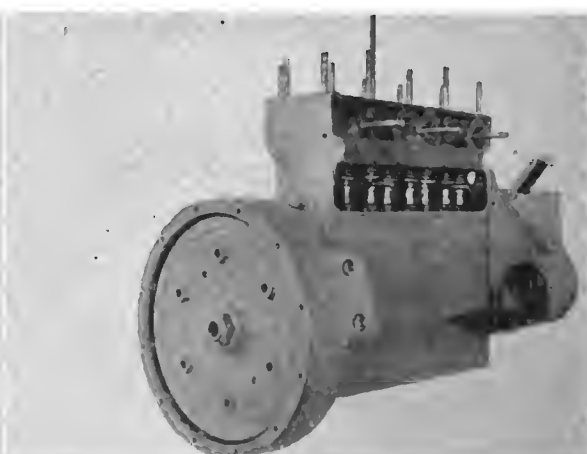
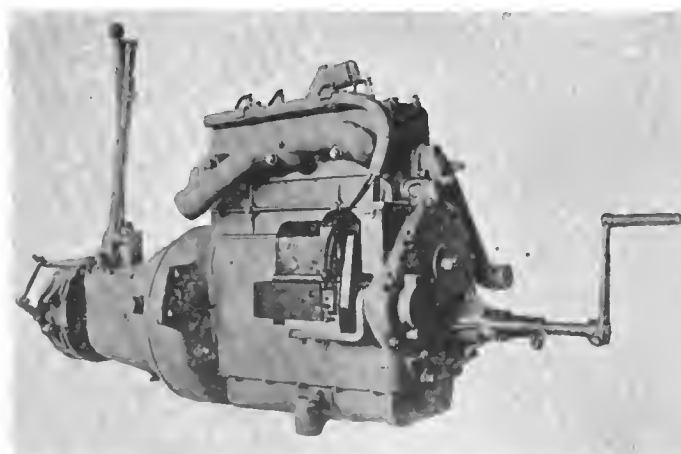
**Two-Bearing Crankshaft, the Large Annular Ball Bearings, Piston and Connecting Rod of the Republic Dispatch Engine.**

water manifolds are large and the system is stated to be very efficient. The radiator is mounted to protect it against the stresses of chassis distortion.

The lubricating system is a special Republic design and is patented. The oil is carried in the base of the crank case and in the reservoir is a plunger pump that is at all times submerged in lubricant. The valve chamber, the cover plate of which is gasketed, is made the source of distribution of the oil, which is pumped to it in such volume that there is always a head, and the flow of lubricant through ducts at either end of the chamber supplies the main and camshaft bearings. The tappets and valves are plentifully supplied and the connecting rod bearings, the cylinders, pistons, wrist pins and cams are lubricated by splash. The overflow from the valve chamber passes through a large glass tube mounted in the front of the engine block and well protected and drains upon the timing gears. The flow of lubricant can be observed upon lifting the engine hood. The oil filler is rectangular and is so located that the oil with which the reservoir is replenished flows over the timing gears.

#### **Some Other Engine Details.**

On noting the illustrations one will see that a very large plate, quickly removable, covers the timing gears, and an extension serves as a support for the starting crank. The housing that encloses the fly-wheel is a separate casting that is bolted to the rear of



**Specially Designed Republic Dispatch Engines: At Left, the Complete Unit Power Plant, Showing the Emergency Brake Back of the Transmission Gearset Housing; at Right, the Cylinder and Crank Case Block with the Head, the Oil Pan and Valve Cover and All Fittings Removed.**



the engine block. The carburetor is attached to a long riser at the left side of the engine, and in this is the Ruggles pneumatic governor, which has but one moving part. This is a spring-retained poppet valve type that is actuated by gas velocity and may be set to afford any result within its range. Normally, or at the standard setting, it closes at 1050 revolutions, which corresponds to approximately 20 horsepower, and it may be locked or sealed. The governor is extremely simple and cannot fail.

The ignition system is a Bosch magneto-generator that is mounted on a bracket at the right side directly behind the timing gearset case and is driven by a gear that is so coupled that variable timing may be obtained without removing the gear that drives it or the magneto. The installation is a high-tension magneto that is mounted on and above the magneto-generator that is driven from a single gear. The magneto supplies ignition current, the spark being fixed, and the magneto-generator generates a six-volt current for lighting and charging the storage battery. If the owner desires a starting motor can be installed at the left side of the engine. The clutch is an eight-plate dry disc type, the discs being 10 inches diameter, that is said to be extremely easy of engagement. The transmission gearset is a selective sliding gear construction, having three forward ratios and reverse. The shafts are large and the gears are of nickel steel, heat treated, with 11/16 inch faces. The shafts are mounted on Hyatt roller bearings. The gearset and its housing are so constructed that there is an external contracting brake mounted at the rear of the power plant, which is the emergency brake. This brake is very substantially constructed and is ample for any requirement.

#### **The Power Transmission System.**

The entire power plant is mounted on a trunnion in the front cross member of the frame and on the frame side members at the rear of the engine block, and it is protected against stresses of any kind. The drive is by a tubular shaft 1½ inches diameter, with a universal joint at either end, to a Torbensen internal gear axle. The wheels are mounted on the I section of this axle and the power is transmitted through a jackshaft, that is bolted to and back of the I section, and spur pinions to large enclosed internal gears in the drums on the rear wheels. The power is applied a considerable distance from the wheel hubs, and there is maintained to be a very high degree of efficiency. The wheel spindles and the gears of the gearset are nickel steel and are very durable. The wheels are mounted on Bower roller bearings, the inside spindle diameter being 1 37/64 inches, and the outside spindle diameter being 1 3/16 inches. The front axle is an I section steel drop forging, with heavy steering knuckles, and the wheel spindles are fitted with ball bearings.

The frame is constructed of pressed steel channel section, 3/16 metal, four inches wide and with two-inch webs, well reinforced and gusseted. The frame

is 161 inches length, 25½ inches wide at the forward end and 38 11/16 inches wide at the rear end. It is suspended on semi-elliptic springs, 36½ inches length and two inches wide forward, and 48 inches length and two inches wide rear. The wheels are wood, artillery type, the forward set having 12 1⅜-inch spokes and the rear set 12 1½-inch spokes. The tire equipment is optional with the purchaser. The Republic company maintains that minimizing the unsprung weight by the use of the Torbensen axle has made solid tires not only practical, but the best equipment for this machine, although pneumatic tires have been regarded as the only wheel shoes that would fully protect the mechanism of vehicles of similar capacity, and the company recommends the use of solid tires. The solid tires are 32 by three front and 32 by 3½ rear, but when pneumatic tires are used these are 32 by four inches. The wheelbase is 110 inches and the tread is 56 inches.

The steering gear is a Jacox construction, worm and nut type, with 18-inch hand wheel that is located at the left side. The control is by the usual clutch and service pedals, a throttle lever on the steering column, and gear shifting and emergency brake levers in the centre of the footboard. The service brake has shoes expanding in drums 14 inches diameter and three inches wide on the rear wheels. The 8½-gallon gasoline tank is under the dash cowl. The chassis is well equipped.

The chassis is fitted with either a full express body with canopy and storm curtains, or a full panel body. The express body is 82 inches long, 42½ inches wide and 11¼ inches deep, with a loading height of 54½ inches. The panel body is 81 inches long, 42½ inches wide and 54½ inches height.

#### **New Model 10 Republic Truck.**

The second new Republic truck of the series is the model 10, which has load capacity of 2000 pounds. This is sold for \$1095 equipped with a stake platform or express body. Model 10 chassis has a unit power plant that includes a four-cylinder, four-cycle, water cooled, L head engine that has a cylinder bore of 3½ inches and stroke of five inches. This engine has a rating of 19.6 horsepower by the S. A. E. formula, but the manufacturer claims that it will develop approximately 30 horsepower maximum. The cylinders are cast en bloc with the water jackets integral and the general details of construction are conventional.

The engine is cooled by a thermo-syphon circulation of water through the cylinder jackets and a Republic designed radiator having cast tanks and a cellular cooling section. Complete radiation is obtained by a large fan driven by a flat belt from a pulley on an extension of the magneto shaft. The lubrication is a combination force feed and splash system. The ignition current is supplied by a Bosch high-tension magneto driven at camshaft speed, and the fuel, either gasoline or distillate, is drawn through a Stromberg type M carburetor. The clutch is a multiple disc type.

The transmission gearset is a sliding gear selec-

tive construction that has three forward speed ratios and reverse. The shafts and gears are of ample proportions and are made of nickel steel. The power is transmitted through a  $1\frac{3}{4}$ -inch tubular shaft having a universal joint at either end to a Torbensen rear axle. The front axle is an I section drop forging with wheel spindles of nickel steel. The frame is constructed of steel channel section  $4\frac{1}{2}$  inches width with ample webs. This is mounted on semi-elliptic springs, the forward set being 38 inches length and  $2\frac{1}{4}$  inches width, and the rear set is 52 inches length and  $2\frac{1}{2}$  inches width. The Hotchkiss system of driving is used, the springs taking the torque and driving thrust. The wheels are wood, artillery type, and are shod with solid tires, the forward set being 34 by three inches and the rear set 34 by four inches. The wheelbase is 124 inches and the tread 56 inches. The steering gear is a semi-reversible construction with an 18-inch hand wheel and is at the left side. The control is by the usual foot pedals and hand levers, the gear shifting and emergency brake levers being at the centre of the footboard. The loading space back of the driver is 98 inches length.

#### **Third New Truck Is Model 11.**

The third new truck of the series is model 11, load capacity 3000 pounds, which is generally built to the same design as the model 10. The engine, however, has cylinder bore of  $3\frac{3}{4}$  inches and stroke of five inches and is rated at 22.5 horsepower. The drive is through a  $2\frac{1}{4}$ -inch tubular shaft to a heavier Torbensen rear axle. The springs are heavier and the frame is longer, the wheelbase being 144 inches. The front tires are 34 by  $3\frac{1}{2}$  inches and the rear tires 34 by five inches. There is loading space 118 inches length back of the driver's seat. The model 11 chassis is sold for \$1275.

Model A, 4000 pounds load capacity, selling for \$1675, and model T, 6000 pounds load capacity, selling for \$2550, are continued, with material refinements and perfections, but the specifications are not changed substantially.

#### **Plant Now Covers 20 Acres.**

The company's plant at Alma now covers about 20 acres. One steel and concrete structure, 1000 feet long, that is now nearing completion, is for the exclusive production of Dispatch trucks, as the model 9 is known, and this is to be paralleled by another structure of the same size and material for the same general purpose. The company recently built and is now using a plant where Republic armored type radiators are produced.

The growth of the works has been very rapid, but it has not kept pace with the demands of the sales department. The company has avoided war business, but the service qualities of Republic machines, together with a general preference for internal gear drive abroad, has been recognized, and it has desirable representation in many countries. The company now has agencies or branches in all of the 48 states and

practically all over the world. It has adhered to a policy of confining relations to distributors and dealers having completely equipped service stations who specialize truck service. The foreign business has increased very rapidly and an interesting fact is that 80 per cent. of all trucks shipped to Australia last year were Republic make. The officers of the company are: President and general manager, Frank W. Ruggles; vice president, T. A. Burt; treasurer, George W. Moore; secretary, Charles Rhodes; general sales manager, M. A. Holmes.

#### **LIQUID MEASURING PUMPS.**

The Bureau of Standards of the United States Department of Commerce has issued a bulletin on liquid measuring pumps which treats exhaustively with the subject of devices employed to dispense gasoline to users of motor cars.

Various types of pumps used are illustrated and described and methods given for sealing them after testing. The bulletin gives the results of investigations made to June 30 of this year, but since then the department has made extensive additional investigations, which have been reported from time to time.

#### **MAINTAINING CONCRETE ROADS.**

The Portland Cement Association of 111 West Washington street, Chicago, Ill., has issued a folder on "How to Maintain Concrete Roads and Streets," which will be sent free, together with further information on the subject, upon application to the association. The association has also published a booklet on "The Concrete Road," prepared by Edward N. Hines, chairman of the Board of County Road Commissioners of Wayne county, Mich., for general distribution.

#### **BOSTON OFFICE FOR ABBOTT-DOWNING.**

The Abbott-Downing Company, Concord, N. H., has opened an office at 394 Atlantic avenue, Boston, Mass., and has leased property at 84 Brookline avenue, in that city, for a sales and service station.

The company for the past 50 years has been engaged in wagon body manufacturing and is now making one and two-ton trucks. Bodies for its own trucks and other makes of trucks will be the principal product of the company from now on.

#### **BUYS FLEET OF ELECTRIC TRUCKS.**

The Salem Laundry Company, Salem, Mass., which had two electric trucks in service, has purchased seven additional Ward machines, making nine vehicles of this type now in use. The economy and efficiency of the first two electrics used, as well as the advertising value, were the factors that impelled the adoption of this equipment.

**FORSCHLER TRACTORS.**

The Forschler Motor Truck Company, New Orleans, La., will soon start production of two types of four-wheel tractors, one one-ton and the other two-ton machine. Continental motors will be used in the power plants and the choice of worm and chain drive will be optional with the purchaser. The one-ton machine will have a 120-inch wheelbase, with 36 by three-inch tires in front and 36 by four-inch rear. A 3½-inch bore and five-inch stroke motor will be used. On the two-ton model the wheelbase will be 144 inches and the tires 36 by four-inch front and 36 by six-inch rear. The motor will have 4½-inch bore and 5¼-inch stroke.

**BIG INDIA TRUCK MARKET.**

C. C. Devore, the resident representative of the Goodyear Tire and Rubber Company at Bombay, India, who recently paid a visit to the Goodyear factory at Akron, O., says that India offers a big field for American trucks. "There are now only about 500 trucks in the country, which is not a very large number when you consider the size of that great empire," he says.

**COBE AND COE JOIN BURD.**

H. H. Cobe and C. F. Coe have joined the Burd High Compression Ring Company's organization at the branch at 899 Boylston street, Boston, Mass. Mr. Cobe is well known to the automobile trade, having been prominent in racing and associated with a number of the best known automobile manufacturing concerns. Mr. Coe is an old newspaper man and recently was with the Curtiss Aeroplane Company, Buffalo, N. Y.

**WHITE TRUCKS IN THE MOVIES.**

F. H. Squires of the White Company recently gave a "movie" party in Boston which was attended by a large number of city officials and suburban road authorities. The picture film shown was that of a fleet of White trucks used in road building service and it showed the machines doing widely differing work, from pulling down trees and uprooting stumps to carrying material and rolling the surface of the finished highways.

**OIL MIXED CEMENT.**

The office of public roads of the United States Department of Agriculture, as a result of recently made experiments, has found that a concrete mixed with 10 per cent of heavy mineral oil when used for road purposes repels water and retains its solidity. The tensile strength of the concrete is not lessened and it is not affected by alkali.

**BUICK STOPS TRUCK PRODUCTION.**

The Buick Motor Company of Flint, Mich., has ceased production of 1500-pound trucks.

**FOREIGN MANUFACTURER  
WANTS INFORMATION.**

Paul Riviere of the Auto-Metallurgique Company of Brussels, Belgium, who is now at the Manhattan Square hotel in New York City, would be glad to receive any information concerning cars and parts manufactured in this country. Correspondence should be addressed to Mr. Riviere personally at his hotel, and should be in French if possible. He would like to receive catalogues, prices and other details from American manufacturers of cars, electrical systems (starting, lighting and ignition,) in lots of 500 at a time; from manufacturers of four, six and eight-cylinder engines, gear boxes, axles, etc. He wishes to arrange for representing American concerns in Europe after the close of the war.

**ELECTRICS FOR NORWAY.**

Electric vehicles are interesting the automobile dealers of Bergen, Norway, and one dealer has already sent a representative to this country to make arrangements for selling electric machines in that country.

Road conditions in Bergen are not thought to be particularly favorable for the use of electrics, the main routes being hilly, with an average grade of 10 per cent. These conditions, however, are not looked upon as prohibitive to the use of electrics.

**"BUY ELECTRICS" CAMPAIGN.**

Since the affiliation of the Electric Vehicle Association with the National Electric Light Association, an intensive campaign has been in progress to stimulate the general use of electrically propelled vehicles by members of the association.

Herbert A. Wagner, president of the organization, has sent a circular letter to all the companies that are members, urging them to order at least one electric truck during the coming year for delivery, and announced that his company had placed an order for 25 electric trucks for resale.

President Wagner said in his letter: "The example and active promotion of the use of electric vehicles by central stations will have great influence in bringing about their general use by the public, which will in turn reflect to the benefit of central stations in securing a very desirable off-peak load in battery charging. One central station is now deriving a yearly income of about \$650,000 from the sale of current for recharging electric vehicle batteries, while many other central stations are enjoying substantial revenues from this profitable class of business."

**SELDEN SALES CONFERENCE.**

At the general office of the Selden Truck Sales Company, Rochester, N. Y., Nov. 2, 3 and 4, took place the first conference of division sales managers and prospective division managers under the regime of Sales Director H. T. Boulden, at which time a full series of the machines that the company will produce was shown, and the company's new advertising and selling campaign was inaugurated. Those present were very enthusiastic and there was unanimous belief that the coming year's business would be much larger than ever before.

The meetings were presided over by Mr. Boulden, who was assisted by President George C. Gordon, Vice President William C. Barry, Jr., and Secretary R. H. Salmons. The Selden sales representatives at the conference are shown in the accompanying illustration.



Selden Sales Representatives at Rochester Conference: 1, George S. Holvey, Rochester; 2, E. W. Templin; 3, Charles N. Gillette, Southeastern District; 4, Charles E. Collard, Atlantic Coast District; 5, General Manager William C. Barry, Jr.; 6, Edward F. Drew, Middle West District; 7, Paul B. Donaldson, Northwest District; 8, W. E. Duxan, Factory Manager; 9, Sales Director H. T. Boulden; 10, J. E. Morse, New England District; 11, C. L. DuPuy, Southwestern District; 12, S. P. Gonid, Rochester; 13, D. S. Everett, Pacific Coast District.

### MUNICIPAL BUYERS OF MOTOR FIRE APPARATUS.

The city council of Cincinnati, O., is considering a bond issue of \$10,000 to provide funds for purchasing a motor engine and other equipment for one of its fire stations. A bond issue of \$28,000 was made to equip the station, but the sum was not sufficient to purchase all the apparatus required.

The American-LaFrance Fire Engine Company has sold three more pieces of motor driven apparatus to the city of Little Rock, Ark. With the delivery of these machines the Little Rock department will be fully motorized.

The city of Harrison, Ark., has purchased a 60 horsepower combination fire truck from the American-LaFrance Fire Engine Company. It is equipped with ladders, chemical apparatus and 1500 feet of fire hose.

The town of Reading, Mass., has placed in service two new pieces of fire apparatus, manufactured by the Robinson Company, St. Louis, Mo.

### THE DUPLEX GOVERNOR.

A 32-page booklet describing the principles, construction and operation of the Duplex engine governor has just been issued by the Duplex Engine-Governor Company, Inc., 36 Flatbush avenue extension, Brooklyn, N. Y. One section is devoted to comparisons showing the following improvements in the truck motor when equipped with a Duplex governor: Increase in available power for all gears, increase in available vehicle speed on low gears, increase in wheel torque on first gear and decrease in average engine speed over constant engine speed governor. It also treats on numerous other advantages that are to be attained with the installation of this device. The text throughout is instructive and is sure to interest every truck manufacturer, owner or operator. The booklet is free to anyone on request.

### ROAD ACROSS UTAH DESERT.

A. N. Johnson, consulting engineer for the Portland Cement Association, will consult with highway engineers and others regarding the concrete road that may be constructed across the desert west of Great Salt Lake by the interests allied with the Lincoln Highway Association. The funds for the road have been largely contributed by automobile organizations and those active in the industry, and President Joy of the association has asked Mr. Johnson to make a survey of the route and report on the feasibility of using concrete.

### RECORD ROAD BUILDING.

The Pennsylvania state highway department recently constructed two miles of roads in 48 hours of continuous work. In this time the stretch was both graded and treated with oil. The work, which was a record performance for the department, was done at Camn Brumbaugh, where the Pennsylvania National Guard was mobilized.

### TRUCK ECONOMIES FOR A STONE CONTRACTOR.

J. C. Coleman & Sons Company, Boston, Mass., a contracting concern that has been using Pierce-Arrow trucks since 1912, has three five-ton machines hauling crushed stone and gravel, and while horses are still maintained for short hauls, the animals are not replaced when they become unserviceable, the concern being committed to power delivery. With rapid loading by gravity the machines do work that could not be equaled with any other delivery equipment operated under similar conditions.

One truck in 10½ hours, from 7 o'clock in the morning until 6 at night, with half an hour at noon, delivered 90 tons, making 16 trips and covering 85 miles. This was done during a rush for delivery, but the average for the trucks is 50 miles a day and the company's figures show an average of about 4.75 miles to the gallon of gasoline.

The trucks each displace three two-horse teams, the vehicle reduction being very important, as the number of horse teams required to handle the work would greatly congest the loading yard and retard the work. When business is dull in winter the company lets its machines for carting snow from the city streets.

### REMOTE ELECTRIC CONTROL.

An elaborate system of remote control for electric testing laboratories which is in use at the Bureau of Standards, Washington, D. C., is described in scientific paper No. 291 by P. G. Agnew, W. H. Stannard and J. L. Fearing. Copies of the report can be obtained without charge upon application to the Bureau of Standards, Washington, D. C.

The bureau has also just published a paper describing a new form of instrument for varying that property of an electric circuit (self inductance) which opposes any change in the strength of a current. This is Scientific Paper No. 290 and will be sent upon application to the bureau.

Another paper recently prepared by members of the bureau staff deals with the international system of electric and magnetic units.

### ELECTRICS IN PITTSBURG.

The Duquesne Light Company of Pittsburgh, Penn., has established an electric vehicle department and inaugurated an aggressive campaign to promote the sale of that class of machines for both pleasure and commercial purposes. A charging station and garage for electric vehicles is being erected in the down town district of the city for the convenience of operators of electric cars and the company furnishes its own trucks for demonstration purposes.

The concern is electrifying its own transportation system and has ordered 11 more electric trucks, which will increase its fleet to a total of 28. Several other companies in Pittsburgh have adopted the electric vehicle, including the Keystone Laundry Company, which has placed an order for five light delivery wagons.

### BEST ROADS BUILT BY WELL TRAINED ENGINEERS.

Roy D. Chapin, chairman of the Good Roads Committee of the National Automobile Chamber of Commerce, says that the automobile has brought new problems that must be studied and solved, including road building, which is developing a new science that calls for the highest engineering skill. Commenting upon the situation Mr. Chapin says:

"In Massachusetts 82½ per cent. of all traffic on the state highway system last year was motor driven. In New York City automobiles, motor trucks and motor buses constitute nearly 70 per cent. of all wheeled traffic, exclusive of street cars and motorcycles. Similar conditions will soon prevail in all parts of the country.

"Rapidly changing traffic conditions demand the services of technically trained men who are not only qualified civil engineers, but who have made a study of road economics and the wearing qualities and cost of construction and maintenance of different kinds of pavements, because the proper administration of road affairs is more essential than the highest degree of engineering skill.

"Too often faulty road conditions are due to too small appropriations in the endeavor to make a cheap surface endure under heavy traffic. Where traffic of any consequence exists the cheapest road to build is usually the most expensive in the end. Efficient highway engineers will save taxpayers millions of dollars in years to come by the selection of proper materials and high class construction work.

"Some of the states and cities require candidates for appointment to the highway departments to pass a civil service examination, thus removing the offices from political influence. This is greatly to be desired. Men who have shown good administrative ability should be continued in office. In the communities where this policy has been followed there is general satisfaction with road and street conditions.

### ELECTRIC STREET SPRINKLER.

The cleaning department of the city of Blackpool, England, uses an electric vehicle for watering the streets. The machine has a special equipment and has given highly satisfactory and economical service for over a year. The vehicle, which is of 3½ tons capacity, carries a cylindrical tank with a capacity of 750 gallons of water, which is fed to sprinklers located at the front. About 25 miles of streets are watered during the morning hours and then the machine is brought into the charging station for an hour's charging before it is put in service again. Six hours is required during the night to recharge the batteries, the current being cut off automatically when the charge is complete. Owing to the high price of gasoline in England the operation of the machine is accomplished at a much less expenditure for power than could be obtained from any other source. Digitized by Google



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PAWTUCKET, R. I.

DECEMBER, 1916

## EXCLUSIVE MOTOR TRUCK COAL DISTRIBUTION.

**Olney & Payne Bros., Inc., Pawtucket, R. I. After Long Experiment, Operate the Main Plant with Power Equipment, Making All Deliveries with Six Pierce-Arrow Machines—Careful Accounting Shows Large Economy.**

**O**PERATING the largest of its two yards exclusively with power trucks for making delivery, Olney & Payne Bros., Inc., Pawtucket, R. I., a coal dealer that has contracts for supplying numerous industrial plants, as well as a large patronage from families, has seemingly well established that coal can be

and with which operating economy was developed.

There are those who assume that animal haulage is more economical if the trips are comparatively short, basing this upon the belief that considerable time is necessarily lost because of conditions that cannot be controlled, either loading or unloading, and this



**The Fleet of Six Pierce-Arrow Five-Ton Trucks Used by Olney & Payne Bros., Inc., for Making Delivery of Industrial Contract and Family Orders from the Main Plant.**

distributed more economically by motor trucks than by animal vehicles, although the greater part of the haulage from its smallest yard is with horse carts.

The experience of the company with motor trucks dates from September, 1912, and since that time it has steadily increased its equipment, carefully keeping records that determined the efficiency of the machines.

assumption is generally accepted by a very large number. There is also equally general acceptance that the longer hauls are most favorable for profitable use of motor trucks because of the faster time that is practical.

The operation of one yard without horse vehicles controverts the prevailing belief relative to using



power trucks for coal distribution without reference to the length of the haul, and as the company has operated both horses and trucks for several years and has records of all work done by both types of equipment and based its determinations upon accounting, there can be no question of the soundness of the finding.

#### The Local Operating Conditions.

Because the company has found that machines are the most economical, a statement of the conditions in which it operates is imperative, that the reader may learn of these in detail. Pawtucket is a city of 65,000 people, at the head of navigation of the Blackstone river and is on either side of the river. The city of Providence is south of it on the west side of the Blackstone and Narragansett Bay, and the city of Central Falls is north of it on the west side of the Blackstone. South, on the east side of the Blackstone, are the towns of East Providence and Barrington; east of these towns and Pawtucket are the towns of Rehoboth

the company, operated largely for family trade.

#### Two Costs for Coal in Yards.

The cargoes delivered by water freight at the Pawtucket piers will cost slightly more than at Providence. To the cost of coal received at the Wilkesbarre Pier must be added the handling and haulage by car to Darlington. But coal received at the Pawtucket water front must be hauled to the Darlington yard, if stored there, and for this reason the difference in cost is not large in bulk delivery at Darlington, no matter which of the two classes of shipment is employed. From the tidewater yard haulage in any direction must be on ascending grades for considerable distances, which means that more time must be taken with animal vehicles, and these ascents are a considerable factor of expense, especially in bad weather.

For years the main yard was the only one maintained, but with the increase of industries and the population on the east side of the city and the material reduction of haulage through car delivery at Darlington, the second yard was established. Generally a radius of four miles from the main yard is the normal limit, although deliveries are occasionally made 10 miles distant.

The company has contracts to supply a number of large industries with bituminous coal which cannot generally be stored in large quantities and must be delivered each day the plants are operated. One of these is the mammoth thread mill of J. & P. Coats, Ltd., said to be the largest works of the kind in the world. Delivery of these contract supplies requires a considerable part of



Loading Bituminous Coal with a Machine Operated by Electric Current That Will Convey a Ton a Minute at a Yard Storage Pile.

and Seekonk, Mass.; northeast are the city of Attleboro and the towns of North Attleboro and Wrentham, Mass., and north are the towns of Cumberland and Lincoln, R. I. Including the northern part of Providence, that has about 100,000 population, there is about 300,000 people in this section.

Cargoes can be delivered by vessel or barge at the piers at Pawtucket, though these are limited by the depth of water in the river channel, at but slight increase of Providence water freight rates, and the Blackstone is open to navigation for at least 10 months of the year. There is a branch of the New Haven railroad through the eastern section of Pawtucket from south to north. The terminal at East Providence is the Wilkesbarre Pier, where the largest coal cargoes are received and transhipped by the railroad company in cars to all central New England points. There is a station and freight yard in the northeastern section of Pawtucket that is known as Darlington, near which is located the other yard of

the equipment continuously, but during the winter months the tonnage demands are greater than during the remainder of the year. Besides these there is a large number of anthracite coal consumers to be supplied, and a substantial patronage from families. The company also deals largely in building materials, but does not trade in lumber.

The Coats plant uses upwards of 30,000 tons of coal a year, and allowing about 300 working days, this means an average of 100 tons must be delivered daily, though there is greater volume consumed during the winter when heating as well as power must be provided for. The other industries having contract with the company do not require as large tonnage, but the needs are equally imperative, and, surprising as it may seem, practically none has provision for storing much more than a single day's supply in power house bins or under cover. There are numerous good reasons why large quantities of coal are not stored by consumers, but the dependance upon the coal dealers to de-

liver continuously as wanted means that they must have sufficient equipment available for this work in addition to what may be regarded as variable demands.

#### **Delivery Required About 100 Horses.**

The company operated close to 100 horses and about 50 carts and wagons up to February, 1913. In September, 1912, the company took delivery of a five-ton Pierce-Arrow truck equipped with a dumping body and hydraulic power hoist. For four years prior to placing the order for this machine members of the company carefully studied trucks and obtained all the information possible concerning their use in the coal trade. Being practical business men there was desire to be fully convinced that the machines were practical and would be economical, and determination was reached to buy a truck and learn from experience its service life and utility in all classes of work before making conversion of the haulage equipment.

But in February, 1913, the drivers employed by this concern, in common with those employed by all other large coal dealers of the city, went on strike. The morning the men struck work a second five-ton Pierce-Arrow truck was delivered to the company. As quickly as possible a five-ton Pierce-Arrow demonstrating truck and several other trucks were hired for the emergency, and the company announced that 50 of its horses and a considerable number of wagons and carts were for sale. The men returned to work after about three weeks' idleness. During that time two members of the firm drove trucks. It was the height of winter weather and the experience these men gained was extremely valuable to them—far more valuable than they were aware of, although they realized that they had obtained knowledge that would later on be beneficial.

#### **Experimental Policy Changed.**

When the strike ended the third Pierce-Arrow truck was bought and placed in service and a number of the horses and carts and wagons were disposed of. While the company's original intention of working a single truck until it was no longer serviceable had been changed because of the disposition to be as far removed as possible from dictation by labor, and the purchase of the two additional trucks had been impelled by conditions that had not been anticipated, with this equipment installed the company believed that all of these vehicles should be thoroughly tried before others were acquired.

When the company operated with horses there was

not the same attention given to accounting that was deemed desirable once the machines were placed in service. The method adopted was intended to demonstrate the cost of all vehicles and careful comparisons were made of work of the same class to determine the relative value of the machines against the animals. The work on which the trucks were used specially for was haulage to the Coats plant which is north of the yard, there being a sharp ascent from the main yard to the city streets and then a gradual climb. Returning light the run could be made with comparatively small consumption of fuel, but the outward run necessarily required a relatively large volume of gasoline and lubricant. The length of the trip was for a long time considerably increased by the change of the road bed of the New Haven railroad, and during this period there was a larger operating cost for the work than was found prior to the reconstruction, as well as a reduction of tonnage carried. This was not a result that continued after the completion of the railroad changes.



**Weighing a Truck Loaded with Bituminous Coal—This Machine Makes from 12 to 14 Trips Daily and a Total Mileage of 40 in This Work.**

When the trucks were first used on the Coats haul the custom of the company was to weigh the machines three times a day, once after leaving the garage with the tanks filled in the morning and again at noon and at night, so that a very close average could be made of the weights and this allowance made against the combined weights of machines and loads in the records. The Coats company, however, required that each truck be weighed twice—when it entered the yard loaded and when it left it light, so the exact tonnage hauled would be known. In the company's yard were at that time scales built for weighing animal vehicles and because of the sensitiveness to vibration accurate records could not be obtained without stopping the engines of the truck weighed upon them. Starting the engine twice each round trip was found to be quite a little delay, and while seemingly not a matter of importance, was a factor worthy of consideration.

The economy of time of weighing might have been

neglected by concerns less exacting, but to conserve the service of the machines new scales were installed in the yards of both companies, these being specially built for use with motor trucks and fitted with thrust bearings that preclude the vibration of the engines while running affecting the balance of the scale beams. The change was believed to be a good investment from every point of view. This statement is made to illustrate the care taken to save time wherever saving was practical.

#### How Time Was Gained.

One should not assume that time economies were not practised with horses, for equal care was given to obtaining the largest results that were practically possible. There was realization, however, that the fullest utility of either type of vehicle could not be obtained by guessing. Record was the foundation of everything.

The main yard of the company, besides being low, is on made land, and no roadways through it have

also affects loading. From the viewpoint of the company there are the best of reasons why the bituminous coal should be stored in the open, and to handle this stock advantageously loading machines were bought. These are specially built and are mounted on wheels so they may be moved quickly. The power is taken from an electric circuit and when located within the radius of the cable turning a switch will start or stop them. The loading capacity is approximately a ton a minute, the only work necessary being trimming the coal so that it is within the range of the chain of buckets that is carried sufficiently high so that the discharge into the body may be wherever desired.

The loading of the trucks with bituminous coal might be made more rapidly with gravity discharge from pockets, but there would not be sufficient gain in time to offset the value of the protection, to say nothing of the additional investment that large pockets would represent. The trucks are unloaded at the

Coats plant by dumping, so that little time is required, simply for hoisting and lowering the bodies, before the machines could be started. The round trip to and from the Coats works is 3.3 miles, and the trucks make an average of 12 trips daily, this being a total of 39.6 miles a day, provided that no other work was done.

When conditions of contract delivery permitted the trucks were worked on other deliveries, but never with less than capacity loads. When residential orders were delivered that could not be discharged by gravity (and the

majority of them were handled in bags) a sufficient number of helpers were sent with the machines to do the work quickly, the purpose being to get the loads off with the least possible delay. When possible to do so chutes were utilized.

All orders that were delivered at considerable distances were sent out by truck, and beyond the normal limit for delivery, which may be placed at four miles, a charge was made for the use of the machine on the basis of hours, the expense for the truck being added to the fixed price for city distribution. In hauls of this character the trucks were evidently more economical than animals, and experiments were made by reducing the length of the deliveries and making comparisons with horse vehicle cost to determine the point where the economy of the one or the other equipment was certain.

By quick haulage (the trucks were geared to a maximum of 14 miles an hour) and by having suf-



Truck Loaded with Anthracite Coal, Partly Bagged. This Being the Usual Manner of Making Residential Deliveries.

ever endured through a winter, heavy surfacing of gravel, cinders, crushed stone and other similar material being broken by the yielding of the water-saturated earth. At times, especially in winter and spring, the yard was badly rutted and besides working in the soft ground the steep ascents to the highways were hard on the animals. For this reason loading and getting away from the yard with horses was often slow. The trucks, however, could be loaded and driven out without difficulty and without loss of time.

The anthracite coal is unloaded from vessels and stored in large pockets from which all vehicles may be loaded by gravity, but the bituminous coal is taken out and carried by conveyors and dumped in the open air under the conveyor trestles, this form of storage being to safeguard against fire that may develop from spontaneous combustion. Not only this, steam coal that is wet does not discharge well and there is possibility of the pockets being frozen in winter, which

ficient helpers to unload rapidly the machines were found to be superior to horse vehicles to within a surprising short distance from the yard, and wherever the cost of the truck was in excess of expense of delivery by horses the greater elasticity of the service and the reserve capacity that was always available was regarded as being sufficient to offset it.

The machines were found to do work constantly for which from nine to 10 horses would be necessary, this not considering the possibilities for overtime and not allowing for the reserve animals that would be required throughout the year. The company developed its drivers from horse carts, training them and insisting upon its instructions being followed. Care was taken not to overload and the machines were carefully maintained. They were given systematic attention and were regularly overhauled at the service station of the Pierce-Arrow agent at Providence. The machines were supervised by one of the members of the company whose experience with them is decidedly interesting. He says that when the trucks were first placed in service if, in the morning when started, a cylinder skipped the carburetor would be adjusted, and this might lead to other attention to remedy what was then believed to be a fault. But after experience with them if the engine was running regularly when garaged for the night no adjustment was made, no matter what the seeming irregularity, and within a few minutes after starting, when the engine had warmed, it would probably run perfectly.

The supposition that there was need of adjustment if the engine skipped after starting was often the occasion of trouble that required time and patience to deal with, and from experience was learned that the engines will afford extremely satisfactory service if kept clean, supplied with lubricant and let alone after being adjusted to operate satisfactorily.

#### **Fleet Increased to Six Trucks.**

The trucks were worked until April, 1916, before there was decision that they were satisfactory from the viewpoint of economy as compared with animal vehicles, and then an order was given for three more five-ton machines fitted with hydraulic hoists and dumping bodies, this increasing the fleet to six. The truck records were kept by one of the active members of the company and he studied carburetion and ignition systems until today he is regarded as being expert with both. His knowledge has been extremely useful, for he has quickly dealt with situations that would have necessitated service station attention,

some loss of service and expense. This intimate knowledge has also been a material factor in reaching a comparatively low operating cost.

The distribution of small loads of coal cannot always be made so that the largest economy is obtained. Less than capacity loads cannot be considered with five-ton trucks, and a full load cannot be delivered to several customers without taking more of the time of the machine than the high operating cost will justify.

The company has two small machines, one of two and one of one-ton capacities, which are used for distribution of orders in approximately the same radius in which the other trucks are operated. These are fast and capacity loads can as a rule be made up, so that they can be kept busy practically all of the time, and in the event of emergency they have a large reserve.

Since the machines were bought last April the company has employed an expert mechanic, who is



**Unloading Bituminous Coal into a Pocket Open at the Sidewalk at the Mill of the Dexter Yarn Company—An Ideal Delivery.**

expected to keep the trucks operative, and who does all work that is possible with hand tools. Overhauling and large repairs are done at the service station. The company has a considerable stock of parts on hand so that any anticipated repair can be made in comparatively short time. The maintenance cost up to the present time has been extremely moderate, which is due to the policy of consistent upkeep. The first truck bought is now in its fifth year, and it has been driven more than 50,000 miles. It is now giving as good service as when first purchased and it has not seemingly evidenced material wear. Neither has the operating cost increased with age. The probabilities are that it will be good for several years to come. The two trucks that have been used for approximately three and a half years have been equally satisfactory and have been driven close to 45,000 miles each. The three trucks bought in the spring of this year are showing daily mileages of from 40 to 45 each.

The work that the first three trucks purchased did between the dates of purchasing and April 1, 1916, are remarkably interesting. As stated, the first truck was delivered early in September, 1912, and the other two in February, 1913, so that this covered approximately three years and eight months for one and three years and two months for the other two. During the period the trucks were driven 111,305 miles, and they hauled 147,000 tons of coal.

For the purpose of analysis the machines were worked 44, 38 and 38 months each, or 120 months in all, and the average monthly tonnage hauled for each month was 1225, or 245 five-ton loads, which may be said to be about 10 loads for each working day. Taking the mileage and dividing it by the total number of months the monthly average is found to be 927.5, or an average of 11,030 miles a year.

The trucks consumed 34,403 gallons of gasoline, which is an average of 3.235 miles to the gallon, and the engines required 4564 pints of cylinder oil, the mileage being 24.3876 miles to the pint. When one considers that the machines were used through four winters, when the greatest volumes of fuel and lubricant are required, the actual average consumption of both is probably somewhat less than the figures show.

Up to the time this article is written none of the worm shafts or worm wheels have been replaced and examinations of the older trucks have not shown wear of consequence. There has been so little wear that the rear axles are practically noiseless.

The trucks were garaged in several buildings in the yard, but the company recently built a garage in Wesley street that has storage space for eight machines and all equipment necessary for the maintenance of the fleet.

#### TEXAS HIGHWAYS DAMAGED BY TRUCKS.

State and county officials of Texas have complained to Major-General Funston that the army trucks operating in that state have damaged the roads to the extent of about \$750,000. It is also reported that officials in Arizona and New Mexico will file similar complaints.

General Funston is reported as having stated that the roads in those states, which are still being used by army trucks can be repaired by the army engineers, but repairs on roads that are no longer in use by the army will have to be provided for by special act of Congress.

#### OYSTER BAY'S NEW FIRE TRUCK.

Oyster Bay, L. I., fire department has put in service a new motor driven ladder truck. The apparatus was presented to the community by a number of wealthy residents headed by former President Theodore Roosevelt, C. K. G. Billings and Mortimer Schiff.

#### WILL DISCUSS HIGHWAY PROBLEMS.

Two joint meetings will be held in the assembly hall of the Automobile Club of America on Dec. 28 to discuss highway subjects. The meetings have been arranged by members of engineering section D of the American Association for the Advancement of Science. The opening session, at 2 o'clock P. M., will be devoted to subjects to be included in the civil engineering curricula of universities and colleges. This meeting will be held under the auspices of the A. A. A. S., the Society for the Promotion of Engineering Education, the National Automobile Chamber of Commerce and the National Highway Association.

A second session will be held at 8 in the evening, at which research papers in various fields of highway engineering will be presented, including several pertaining to the use of motor trucks and their relation to highway construction. The Automobile Club of America, the American Association for the Advancement of Science, the National Automobile Chamber of Commerce and the Citizens' Street Traffic Committee of Greater New York will be represented at the second meeting.

#### REGISTRATION FEE FOR TRAILERS.

An opinion given by Attorney-General Hinman of Connecticut has resulted in the automobile department of that state requiring a separate license for all trailers, whether of two or four wheels.

A Ford owner recently applying for a license wanted to include his two-wheel trailer in the registry fee of \$11, but Chief Clerk Wetstine informed him that an additional fee of \$15 would be required for the trailer, which would have to have a separate license.

In Mr. Hinman's opinion, when a truck, detachable from either truck or pleasure car, was attached to a truck the carrying capacity of both trucks should be added and taxed according to the total capacity of both.

#### REMOVE SNOW WITH TRUCKS IN BOSTON.

The motor trucks used in the city of Boston following the big storm two weeks ago, proved effective and economical in removing the snow from the city streets. They not only carried heavier loads and made many more trips in the course of a day, but in their use the absence of horses falling and incidental accidents are noticeable.

#### TRUCKS FOR EXPORT DELAYED.

There is more than \$500,000 worth of motor trucks standing in a vacant lot in Long Island City waiting to be shipped to Russia. The shortage of vessels has caused the delay in shipment.



### GIRL HEADS STANDARD MOTOR PARTS COMPANY.

Christian Girl, formerly president of the Perfection Spring Company, Cleveland, O., has been elected president of the Standard Motor Parts Company, which is a combination of the first named concern and the Standard Welding Company, also of Cleveland.

As the result of the merger there will be little change in the method of managing or operating the two companies, except that the Perfection Spring Company plant will be the spring department of the Standard Motor Parts Company and the welding plant as the rim and tube department.

The other officers elected were: F. W. Prentiss, first vice president; E. W. Farr, second vice president; T. E. Borton, treasurer. The officers and C. C. Bolton and Arnold S. Goss comprise the directorate. P. A. Connolly is secretary of the company.

### NEW \$5,000,000 TRUCK COMPANY.

The Bethlehem Motors Corporation, recently organized by capitalists identified with the steel industry in Allentown and Bethlehem, Penn., and headed by Arthur T. Murray of Norwalk, Conn., is erecting a new plant at Allentown, where light trucks will be manufactured on a large scale.

It is understood that the new company will be capitalized for \$5,000,000. Arthur T. Murray, the president, was sales manager of Mack Brothers Motor Truck Company and formed the Brady-Murray Motors Corporation of New York City four years ago. He recently sold his holdings in this corporation, which is distributor of Chandler cars in the metropolitan district.

J. M. Breitenbach, secretary and treasurer of the Brady-Murray Motors Corporation, will assume the management of the company's affairs.

### HOOVER 1500-POUND TRUCK.

The Hoover Wagon Company, York, Penn., is now building commercially a 1500-pound delivery truck. The power plant is a block cast engine with bore of  $3\frac{3}{4}$  inches and stroke of  $4\frac{1}{2}$  inches, that is cooled by a thermo-syphon circulation through a cellular radiator. A high-tension magneto with hand adjustable spark advance supplies the ignition, and the drive is through a three-plate clutch and three-speed ratio transmission gearset and by shaft to a worm driven, semi-floating axle.

### VAN DUZEN NOW A MANAGER.

Don C. B. Van Duzen, formerly a dealer in Mack trucks in the territory in and about Knoxville, Tenn., has been appointed southern district manager of the International Motor Company, with headquarters in New York City. His territory includes the states of Georgia, Louisiana, Mississippi, Alabama, Florida, North Carolina, South Carolina and Tennessee.

## TRUCK EARNS COST EACH YEAR

### Five-Ton Machine Operated by Manufacturer Saves Its Value in Freight Rates and Affords Better Service.

WHEN a truck will save more than its cost in a single year's work, and has done this for three successive years, or at least very closely approached the ratio of earning stated, it may be regarded as good investment. This long period of operation demonstrated as well that this economy can be depended upon for the future, and, incidentally, statement can be made that with increased cost of freights the saving for the present year will probably exceed that of any previous 12 months.

This is the experience of Winslow Brothers & Smith of Boston, Mass., operating a factory at Norwood, a suburb of that city, with offices and salesrooms in the city. The round trip between the two points is approximately 30 miles. Norwood is a station on the New Haven railroad system and the material to be manufactured was transported to that town by rail previous to the purchase of the truck, and the finished products were then shipped to the salesroom, or sent by rail to customers in different parts of the country. The greater part of the firm's business, however, is done in New England, and a considerable proportion of its sales are made at the salesrooms, where deliveries are made to vicinity customers.

The company deals in leather in different qualities and grades, finished kid, calfskins, sheepskins and wool, and the stock is obtained in the open market, much of this being obtained in Boston, although shipments are sometimes made direct to the factory. For years the only service was the railroad, and because of the desire to minimize cost shipments were made by freight. Though the distance is comparatively short the time required was with rare exceptions days instead of hours, and there was always an uncertainty that necessitated

carrying large stocks and the customers frequently exasperated from delays. In addition to these conditions the freight rates were comparatively large.

After exhausting every possibility that existed for better service, and as the freight rates were soaring, the company decided that it would purchase a truck and haul its own stock and material over the road, and depend upon its own resources for transportation between the salesrooms and factory. There was belief that with the trucks the company could better control its supplies and distribution, even if there were not a large measure of economy resulting.

The firm began an accurate accounting of the expense of operating and the earnings of the truck, and this was developed and improved from experience. The results obtained in 1915 showed that including overhead, gasoline, oil, grease, repairs, tires, labor, depreciation, insurance, taxes, etc., the operating cost was \$5252.95. During the year the truck carried 3,916,400 pounds, or 1948 tons and 400 pounds, which would have cost at railroad freight rates \$10,678.82, so that the machine actually saved \$5425.82, which exceeded the original investment by a considerable sum.

The truck was worked 295 days and made 608 trips, it being withdrawn for eight days to have the first overhaul, after three years' constant use. The cost of operation by days was \$17.77, and by miles \$0.4034, and the mileage to the gallon of fuel was 3.75. The total distance driven was 12,994 miles, or 44.03 miles a day, and the average mileage of the trips was 21.36. The owners estimated that the machine has at least saved its cost for them each of the three years, and the truck is now affording service that is equal to that of the first year and at no materially increased cost.



Five-Ton Pierce-Arrow Truck, Operated by Winslow Bros. & Smith, That Earns Its Value Yearly Freightling Between Boston and Norwood, Mass.

## WORKING TRUCKS SHORT HAULS

### Seven-Ton Sterling Machines Make Large Economy in Poultry Food Distribution in Busy Chicago Streets.

By R. W. Hutchinson, Jr.

**D**URING the past 10 years the fancy poultry raising business has become one of the largest branches of specialized farming. The impetus to poultry farming given by the fabulous prices paid by fanciers and connoisseurs for prize specimens and the incentive to the suburban dweller from the large number of poultry exhibitions and publications, has resulted in the poultry feed business becoming the third largest branch of the milling business. The consumption of prepared poultry feeds runs in the millions of dollars and millions of pounds per year.

Among the manufacturers of poultry and live stock feeds, the house of Hales & Edwards of Chicago is the largest in the Central West. The transportation problem of Hales & Edwards is essentially a short and medium haul heavy duty one, consisting of the haulage of the prepared feeds from two large mixing plants in Chicago to not only jobbers located in Greater Chicago, but to the terminals of rail and steamship companies. As the several brands of feeds, among which Red Comb is most widely known, are sold to the consumer in 100 pound sacks, the body equipment of the seven-ton Sterling trucks is a large covered grocery type body with open or stake type side doors to permit of easy loading and unloading from both side and rear. At the feed mixing elevators where the product is sacked, there are conveyor chutes or slides which deliver the sealed sacks immediately at the tail gate, so that two helpers standing in the body can quickly pile them one on the other into position.

The recognition of the value of a minute in motor truck economy and efficiency by Messrs. Hales & Edwards is readily apparent by the performance data of tonnage hauled by one of the

seven-ton Sterlings as given in the tables below:

#### SUMMARY OF STERLING TRUCK TO AUG. 1, 1916.

	Mileage	Tonnage In Pounds	Gals. Gasoline	Gals. Oil	Wages	Hours Run	Earnings
January...	996	1,198,589	250	14½	\$151.67	175¼	\$441.69
February...	787	1,097,080	257	13	145.83	176¼	406.88
March.....	988	1,250,831	289	16¾	157.50	204¼	461.18
April.....	870	1,214,539	253	18½	145.83	179¾	455.34
May.....	955	1,195,174	265	17½	157.50	198¾	438.10
June.....	931	1,226,796	249	16¾	151.67	197¼	460.93
July.....	941	1,086,062	244	15½	151.67	181½	406.26
Totals..	6248	8,269,071	1807	112½	\$1061.67	1212½	\$3070.37

#### EXPENSE.

1807 gallons gasoline, 18½c gallon	\$334.30
112½ gallons oil, 32c gallon.....	36.00
Wages .....	1061.67
Tires .....	447.84
General repairs.....	75.00
Total.....	\$1954.81
Net earnings.....	\$1115.56

As Messrs. Hales & Edwards state, this record was instrumental in the purchase of the second truck. The Hales & Edwards Company also recognize the value of the highest grade, highest priced driver. Their drivers are paid considerably above the average wage for truck drivers. And the dividend return of competent truck drivers is well reflected in the unusual low up-keep cost for handling this relatively large tonnage. When a truck user can handle nearly 4200 tons in a seven-ton truck for a maintenance cost of only \$75, the investment return on an efficient driver's wages is a big factor. The most significant lesson from Hales & Edwards' experience is this important one of getting the best driver that can be had and paying him accordingly.

As the Hales & Edwards Company was prior to the installation of the first seven-ton Sterling not a user of motor trucks and, necessarily, had to adjust

their methods and systems to the increased efficiency of motor transportation, the tonnage handled in the seven months' period necessarily is considerably below that which they are now handling and their average monthly operating expense on their battery of Sterlings is also declining. Nevertheless, the result is unusual in that the figures show a cost of only 21.9 cents per ton, or .074 cents per ton-mile for motor truck delivery as against the estimated cost of 38 cents per ton and 12 cents per

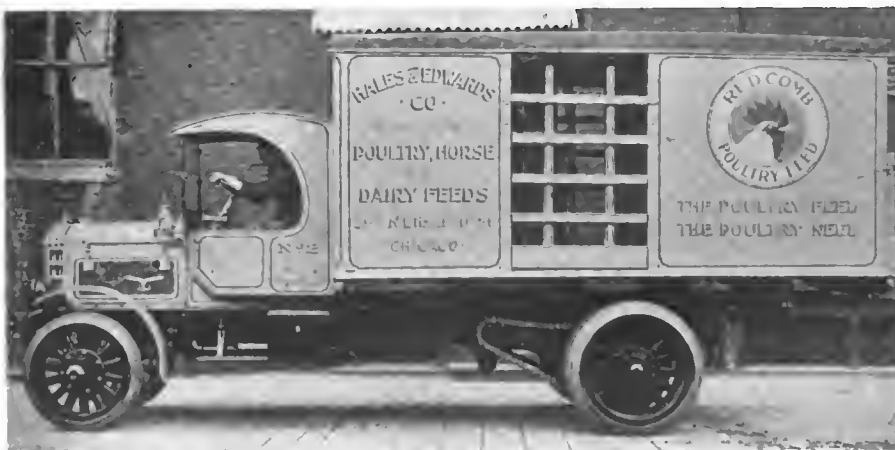
ton-mile with horse drawn trucks. The Hales & Edwards Company did not begin to keep accurate haulage cost records until they installed their first Sterling, and another significant lesson in their experience is that the motor truck has taught them the value of keeping real, accurate cost data.

Although the data shows truck earnings of \$1115.56, this only partially represents the economy of the seven-ton Sterling to Hales & Edwards. Each seven-ton Sterling has replaced four three-hitch trucks, and although accurate figures, as stated, on the horse drawn haulage are not available, Messrs. Hales & Edwards estimate that in an equivalent seven months' period each seven-ton Sterling has handled in addition 33 1/3 per cent. more tonnage and that the total upkeep cost per seven-ton truck in comparison with the equivalent number of teams replaced is approximately 40 per cent.

Considering the fact that the efficiency of Hales & Edwards' battery of seven-ton Sterlings is considerably reduced by the usage of the trucks almost entirely in the heavy traffic zones of Chicago, where congestion and frequent waiting at terminals is common, their achievement with motor transportation is really somewhat extraordinary.

The Hales & Edwards' fleet of seven-ton Sterlings is also an interesting example of the truck user taking the maximum advantage of the advertising value of motor trucks. Being the largest straight motor trucks running on Chicago streets, the enormous body with the trade mark of the rooster's head in red, constitutes a veritable moving billboard of greater publicity value than hundreds of dollars invested in stationary boards. Towering above even the largest of other trucks, the most blasé Chicagoan invariably turns around to look at these moving bulletin boards.

The S. K. F. Ball Bearing Company of Hartford, Conn., has appointed Horace N. Trumbull advertising manager of the concern.



One of the Fleet of Sterling Seven-Ton Trucks Operated by Hales & Edwards, Distributing Poultry Food in Chicago, Ill.

# KNICKERBOCKER MOTOR TRUCK REORGANIZATION.

The Knickerbocker Motor Truck Manufacturing Company of New York City has been taken over by the Knickerbocker Motors, Inc., of that city, which was recently organized with a capital of \$500,000 to absorb the first named company and manufacture motor trucks on a larger scale. The new concern will occupy the same plant at 151st street and River avenue in the Bronx.

The production planned for the coming year is 500 chassis, and will include a 2½-ton truck, a 5½-ton truck and a three-ton tractor.

The officers of the company are: H. G. Streat, president of the Streat Coal Company, and founder of the Knickerbocker Motor Truck Manufacturing Company, president; A. C. Brady, vice president and sales manager; H. G. Streat, Jr., treasurer; W. C. Guilder, production manager. Mr. Guilder was formerly production manager of the Kelly-Springfield Motor Truck Company and was designer of the first Garford trucks and Mack trucks. He was also with the Timken-Detroit Axle Company as production expert.

The directorate is composed of H. G. Streat, Clarence A. Ludlum, Charles H. Class, W. H. Bonyng and Grove D. Curtis. According to a statement made by W. A. Lewis and J. B. Linn, who managed the underwriting for the company, that of the \$500,000 capital, all of which is common stock of a par value of \$10, \$250,000 will be placed on the market to be subscribed for, the acceptance of the subscriptions being contingent upon the whole issue being taken and paid for.

## TRUCK GASOLINE DELIVERY.

Four two-ton Pierce-Arrow trucks are used by the Bartells-Maguire Company of Milwaukee, Wis., to deliver kerosene and gasoline to stations and consumers within the city limits.

The machines not only make numerous stops, but make deliveries at places which are extremely difficult to reach. These trucks have replaced 10 teams and not only afford a much more satisfactory service, but cover a larger radius and make better time. The tanks on the trucks are divided into three compartments to facilitate quick loading and have a total capacity of 700 gallons. Each truck will average about 8000 miles a year and the gasoline consumption runs at the rate of about six to seven miles to the gallon. Every day in the week the trucks are in service and they have made an exceptional record for reliability, only two days having been lost since they were placed in service last January.

## AUTOS IN BRITISH GUIANA.

The imports of motor cars into British Guiana during 1915 numbered 57 as compared with 37 in 1914. Of the total, 47 came from the United States and eight from the United Kingdom.

# TRUCK REPLACES RAILROAD CAR.

Country Club Equips Chassis for Rail Operation and Makes Direct Saving of \$190 a Month in Power Cost.

**P**RACTICAL economies through the use of gasoline motive power are seemingly unlimited, which is largely due to the fact that internal combustion engines are extremely efficient as compared with other types, are very light and are so well understood that they may be regarded as in every way dependable. The fact that a power plant using gasoline for fuel is entirely independent, and with a sufficient source of gas and lubricant can be almost instantly available, makes it probably the most generally satisfactory prime mover that has ever been conceived.

How great the saving may be is little understood or realized. One of the possibilities that has not been developed to any material extent is driving single railroad units. The electric railroad is more economical than steam, yet there is necessity of operating sources of power constantly to serve an entire system, even though but one car is in service at a time, while the gasoline driven car may be operated for the cost of fuel and lubricant for the one power plant.

A striking comparison is afforded in the experience of the Midlothian Country Club, an organization with large recreation grounds and club house located about 2¼ miles from the Midlothian station of the Rock Island railroad, with a membership composed largely of Chicago business men. To convey its members to and from the Rock Island station the club constructed a standard gauge railroad track from Midlothian to the club grounds, and purchased a car that was driven by electric power from a public service company's lines contiguous to the grounds.

uous to the grounds.

The round trip by electric car costs for power approximately \$3.50, no matter whether one or a score of passengers are carried, Saturdays, Sundays and holidays, the car usually carries full freights each trip and the cost a passenger is relatively small, but when there are few passengers the expense is in ratio to the fixed operating charge. The club officials wanted service that would convenience all members, but at the lowest possible price.

After considering the condition a gasoline engine driven unit was decided on, to be used when the number of visitors to the club was small or when the electric car was inadequate for the requirements. A 2000-pound International truck chassis was purchased, this being the standard type, and to adapt it to club service a rigid front axle and flanged wheels were fitted, and on this was installed a commodious 'bus body. This is now operated instead of the electric car, regular railroad equipment being used only Saturdays, Sundays and holidays. The gasoline car, for this term best defines the machine, makes regular trips to all trains and the cost for fuel and lubricant is but 10 cents a trip, or a saving of \$3.40 as compared with the electric. The machine has been in service for nearly a year and during that period it has saved the club an average of \$190 a month, and has through this economy practically earned its cost. Its usefulness will no doubt continue for a long period, for being operated on the railroad track there is very little mechanical deterioration.



International Truck Chassis, Equipped with Flanged Wheels Operated on Track by Midlothian, Ill., Country Club in Place of Car.

## TRUCKS IN TELEPHONE SERVICE

Reconstruction of System Rapidly Done and With Savings That More Than Paid for Machines in Year.



One of the Two Denby Trucks Used in Unification and General Haulage Work of the Southern Michigan Telephone Company.

WHEN in the spring of 1915 the Southern Michigan Telephone Company began the unification of its equipment and service in the territory in which it operates in the southern part of Michigan, the problem of doing this work with the greatest economy necessitated very careful study before determination was reached. The company's system then consisted of 17 exchanges in towns and cities, and it has consolidated in this the telephone lines and properties of seven rural companies.

The headquarters and home office of the company are at Burr Oak and from that place the work was supervised and the material distributed. Toll lines reached all of the exchanges and connected with other towns and cities in all directions. Rural lines extended to almost every farm in the territory of each exchange. Each town and city had its own service and because there were so many small companies operating independently there was duplication of almost 75 per cent. of the lines. The work of consolidation required that these duplicate exchange lines and equipment, covering a wide area, be reconstructed into one system that would be adequate to afford every service, meet the demands of expansion and yet be economical of maintenance.

President A. C. Himebaugh, president of the Southern Michigan Telephone Company, planned the reorganization and the reconstruction of the system in the most practical and economical manner. His experience had taught him that the time required for the transportation of men to and from their work represented about 25 per cent. of the wages paid, and he desired to minimize this loss of time, especially when the employment of a large force of men was necessary.

The men had until that time been carried back and forth with horse wagons,

which meant that time could not be saved with animal equipment, and Mr. Himebaugh after a visit to Detroit purchased two Denby trucks—one for each construction crew. The machines were placed in charge of the crew foremen, who drove them much of the time, which assured good care and attention and the maintenance of a good time schedule.

The result was shown by careful record to be a saving of two hours a day for each crew of 10 men each, or 40 hours daily, which represented approximately the price of one truck saved in less than a year. This was but one item of expense and there were several others of almost equal importance. Before the trucks were purchased much time had been lost in the transportation of material from the one exchange to another because of poor railroad facilities. The longest distance between exchanges was slightly more than 50 miles. When much of the material was moved by truck delays were obviated and the cost was less than for railroad transportation. As the workmen were taken to and from their hoarding places by the trucks they were better satisfied than if they ate late or cold meals.

Where streets were paved, as at Three Rivers, Sturgis and Coldwater, the underground cable was hauled by the trucks, the ends of the cable being made fast to draw bars at the rear of the frames and the machines driven at low speed. This was an economy, for previously extra men were employed for this work, and a decided saving of time. After storms, where quick repairs were needed, the trucks and crews were quickly at places of damage and restorations were made with comparatively lessened loss of service. Poles were hauled on wagons drawn by the trucks as fast as the construction of the wagons would endure. Tools, crossarms, wire,

cable, instruments and all equipment were hauled, and the machines were kept busy while the men were on work that kept them in one place for any considerable length of time.

Materials were hauled from freight houses to exchanges or store houses and cartage bills were much reduced. During the first year the trucks were used the actual cost of repair parts was only \$6 for each machine. The mileage was approximately 11 miles to the gallon of gasoline, and when one understands that the trucks were used on country roads and where the surfaces were poor a good part of the time this showing was exceptional. Not only this, with the trucks the reconstruction, which would have required from two to three years with horse equipment, was completed in 18 months.

These trucks are now used with smaller crews for the regular construction, maintenance and rebuilding work necessary with a telephone system, and they show consistent profits for the company, although they paid for themselves during the time of unification of the service. The maintenance cost of the trucks was less than that of horse equipment of equal capacity, and when the trucks were in operation several teams and wagons were disposed of. In the opinion of the Denby company telephone companies can frequently obtain substantial savings with trucks, and the smaller companies are good prospects that are often overlooked by salesmen.

### LONG TRIP FOR TRUCK TRAIN.

A fleet of Packard trucks in the government service on the Mexican border recently made one of the longest journeys ever undertaken by a truck train in the regular army. The fleet, which was in command of Capt. O. L. Brunzell, went from El Paso, Tex., to Fort Sill, Okla., a distance of 1195 miles, in 192 hours and 17 minutes actual running time. Eighteen days and eight hours were required for the journey.

The run was phenomenal as the roads were bad, due to rains and floods, and bridges were in such shape that some of the trucks had to carry bridge materials to make necessary repairs and strengthen the structures before passing over them. Despite the many road difficulties the trucks averaged 56.5 miles a day and every machine finished the journey in good condition. The gasoline consumption by the fleet averaged five miles to the gallon a truck.

### NEW ONE-TON WILSON TRUCK.

The J. C. Wilson Company of Detroit, Mich., has announced a one-ton truck to be placed in the market in addition to the well known two-ton single chassis upon which the company has specialized. The new machine will include many of the characteristics and qualities of the two-ton truck.



## PIERCE-ARROW TRUCKS FOR BREAD DISTRIBUTION.

The Moore Bread Company of Philadelphia met one of the conditions arising from the expansion of its business by the use of four two-ton Pierce-Arrow trucks. A schedule of delivery over a radius of 40 miles is maintained with these trucks, equal in punctuality to train service and quicker and more reliable than is the express service.

Six days a week the machines are operated at top notch mileage, but are not operated on Sundays. An average of 98 miles a day is being made by two of the machines and the other two average 97 and 96 miles a day respectively.

In the course of a month one of the trucks was driven 2470 miles, made 780 stops and delivered 117,000 loaves of bread. The truck delivery was inaugurated by the Moore company in January of 1915 with the object of extending the concern's business and retaining it by giving prompt deliveries at the stores. Other forms of delivery had proven unreliable and the business is of a nature that quick and reliable deliveries are of first importance. Weather conditions do not delay or interrupt the operating schedule, which was maintained throughout last winter with less variability than would have been experienced had express service been the means of distribution.

Loads of 5000 loaves have been put on one truck at a time. The bread is packed in specially constructed boxes to fit the machine. It takes about 30 stops to deliver an average load.

The trucks leave the bakery at 2 o'clock in the morning and are back at the garages at noon. The gasoline consumption is about one gallon for seven miles.

## NEW TYPE OF JITNEY 'BUS.

Operators of jitney 'bus lines in Canada have introduced a new type of car known as the Fadgl "flexible." It is a combination of a large passenger body with a seating capacity of 12, and an ordinary touring car chassis. The passenger body has two wheels in the rear and is supported on a ball and socket joint located forward of the rear axle of the car chassis. The driving axle, which is in the middle, is connected with an automatic steering lever which causes the rear wheels to track the front wheels, giving the car as short a turning radius as the ordinary touring model.

The designers of the car claim that the method of suspension employed in connecting the two units, eliminates the rocking effect ordinarily found in the big type of 'buses, and also prevents the passengers from feeling the vibration of the engine. In case of a break down to the engine member, the main body may be jacked and another power unit substituted.

E. E. Smith, 948 Jefferson avenue, Akron, O., has been appointed an agent of the H. J. Koehler Motors Corporation.

# MOUNTAIN CLIMBING CONTRACT

## Mack Truck With Overload of 300 Per Cent. Ascends Mount Wilson With Casting for Carnegie Observatory.

**M**OUNT WILSON, CAL., on which is located the famed Carnegie astronomical observatory, because of this scientific institution, is one of the best known peaks of the Sierra Mountains, and rather strangely, it was one of the first of the high mountains that was ascended by motor trucks. When the observatory was first projected there was a trail to the summit, and to haul the materials and apparatus to the site of the observatory differing types of vehicles were used.

This necessitated the construction of a road nine miles long, and as may be assumed this was narrow and followed the line of least resistance to reduce construction and maintenance cost. After the observatory had been completed a special machine was built to haul the great lenses, which had to be guarded carefully to prevent damage. Giant telescope lenses are so affected by vibration or jars that they can only be transported in specific conditions that thoroughly protect them, and they must be turned frequently to neutralize the influences that might distort and possibly ruin them.

This road has been used for a period of about 10 years, and over it all of the material used for the new 100-inch telescope that is now being erected at the observatory has been hauled. Many of the parts are large and cumbersome, but the most massive of all is the 10-ton casting that was designed as the base on which the mammoth telescope will be mounted. Delivering this at the railroad station by car was an undertaking that aroused no special interest, but hauling it up the long ascent was quite another proposition.

J. A. Stoner, manager of the Mack Motor Truck Company, Los Angeles, Cal., maintained that a truck could do the work and furnished a 3½-ton machine. When on the truck platform the assembly was so high and the centre of gravity so much above the ground that driving the machine necessitated extremely careful and cautious work. Mr. Stoner decided to drive himself. The climb was accomplished without mishap so far as damage to the truck was concerned, but by the crushing down of the outside edge of the road under the right rear wheel the machine was at such an angle that there was danger of it rolling

down the mountain side only the strength of the left rear wheel and tire holding it.

For more than five hours the truck remained in this condition, until tools and apparatus could be obtained with which the truck was hauled upon the roadway. Then the engine was started and the truck continued the climb and the load was delivered. Examination showed that no damage had resulted from the very great strain upon the axle and wheels from the 200 per cent. overload or the crumbling of the road that caused the left rear wheel to carry practically 400 per cent. more than a normal freightage and changed the line of support to an angle that the construction was never meant to endure.

## TRUCK EXPORTS DECLINE.

The exports of trucks from the United States during the month of October totaled 1144, valued at \$3,635,291, as compared with 1596, valued at \$4,307,190 during the corresponding month in 1915.

There were 15,917 trucks, valued at \$44,006,346, exported for the first 10 months of this year, as compared with 18,865, valued at \$52,076,406, during the 10 months ending with October in 1915.

## SCHAAF IN TRACTOR COMPANY.

A. R. Schaaf, well known in the automobile industry as secretary of the Fiat Automobile Company at Poughkeepsie, N. Y., has become associated with Carl G. Fisher in the manufacture of a new tractor. Mr. Schaaf, who will be factory manager of the new organization, was connected with the Pope Manufacturing Company at Toledo, O., before joining the Fiat organization.

## UNITED STATES TRUCK CORP.

The United States Truck Corporation has been incorporated at Dover, Del., with capital stock of \$5,000,000.



The Mack Truck, with Casting Weighing Nearly 10 Tons, Held by Wheel and Tire When Road Crumbled Beneath It on Mountain Road.



## TRUCK-TRACTOR PAYS \$60 A DAY

**Machine Worked with Trailer Trains for Sand Haulage Makes Remarkable Economy During Construction Season.**

**H**AULAGE economies through the use of trailer equipment is not generally understood or realized by those who own or operate power vehicles because those utilizing trailers are a very small fraction of one per cent. of their number. From time to time, however, operating statements are made that show surprising results in conditions that are by no means infrequent.

The Detroit Trailer Company, maker of two and four-wheel trailers for power trucks, which has followed closely the uses made of vehicles it builds, states that one of the most interesting examples of trailer economy was obtained by a sand and gravel company with a short wheelbase worm driven truck, for which double equipment was built. The trailer body is constructed to have six tons capacity and it is so built that it may be

for general purposes when the trailers were not required. The company bought the truck chassis, the semi-trailer body, the small body and nine trailers to replace the 12 teams. The trailers were operated in trains of three each, each trailer having three cubic yards load capacity, one train being at the dock, one on the road and one at the destination.

The plan was to have one train loading, one unloading and one on the road all the time during work hours. At the points of loading and unloading snatch teams were used to haul the trailers about so that there was no slow work done by the truck, the loading place being of small area and at the unloading point the material was dumped wherever required. The truck and trailers took the place of 10 teams and is maintained to have earned \$60 a day on the

The Detroit Trailer Company has in many instances supplied three-ton trailers to be used with two-ton trucks loaded to capacity, this making a total payload of five tons, and the owners state their satisfaction despite the widely varying operating conditions. One company used a two-ton four-wheel driven truck carrying a normal load and hauling a five-ton trailer carrying a full load between a sand pit and a road work several miles distant, and stated that the machine had never been "stuck" when common sense was used; that when the truck could not draw the trailer out a second truck coupled to it would quickly end the situation.

During a recent demonstration to a company that had used three-ton trucks without trailers, whose officials wanted to be satisfied that the trailers could be taken wherever a truck could be driven, a short wheelbase truck and a five-ton trailer was used where single trucks could not be, or had not been, used. This form of practical test was sufficiently convincing.

The company maintains that while there may appear to be a loss of utility by shortening a truck chassis, there is abundant evidence that a three-ton chassis, carrying between two and three tons and hauling a five-ton trailer, will so increase the tonnage capacity for hauling that the cost will be greatly reduced, and will at the same time double the service life of the truck. This increase can be obtained for an additional cost for gasoline of not more than 15 per cent. Not only this, when the truck has ceased to be serviceable the trailer will be equally economical during the life of the second truck. The company is further prepared to sell its trailers with guarantee that any good three-ton truck can haul a five-ton trailer in fair conditions, and as fast as any truck should ever be driven.

### PULL-MORE TRUCK COMPANY.

The Pull-More Truck Company was recently organized in Pittsburg, Penn., by a group of men interested in steel making in that city. The new concern has offices in the Frick Annex, Pittsburg, and building operations on a plant will be started immediately. It is expected that deliveries will be made early in the new year. The officers of the company are: Edward M. S. Young, president; H. P. Bope, vice president; John M. Richards, general manager; directors, Kenneth R. Cunningham and A. X. Schiller and the above named officers.

Other prominent steel men interested in the organization of the company are: B. G. Follanshee, president of Follanshee Bros.; D. M. Clemson, director of the Carnegie Steel Company; J. W. Kinnear, director of the Firth-Sterling Steel Company; George Greer, chairman, La Belle Iron Works.

G. E. Smith has succeeded F. L. Swanberg as sales manager of the Blair Motor Truck Company of Newark. O. J. P. McCune and F. O. Spaulding are in charge of the factory.



Truck with Trailer Unit Used for the Haulage of Asphalt by the Park Department, Detroit, Mich., with Marked Economy.

detached from the truck chassis in not more than five minutes. The trailer body is fitted with a drawbar for towing four-wheeled trailers.

In the spring of the present year the sand company made contract for the delivery of sand and gravel at a point about five miles distant from the dock where the material is received in boats. To make the required number of deliveries daily 12 two-horse teams and carts and drivers were in service, and the expense of these units was \$6 a day each. After operating with the horse teams for about a week and finding the cost excessive the company consulted with the Detroit Trailer Company and was advised to use power vehicles.

The equipment advised was a short wheelbase truck chassis with a small body that would carry about a ton, to afford traction, for use with a train of trailers, and a semi-trailer body for use

contract from last May until the end of the season a short time since.

The trailers were each equipped with a pole for horse work, so that changing the towing pole for the horse pole was done in a moment, and the trailers were hauled singly by the horses and made up into trains, so that coupling and uncoupling and straightaway hauls was the work done with the truck. There was practically no lost time, and the average time made by the trains was about 8½ miles an hour. The sand company states that the truck and trailer equipment has more than paid for itself by its earnings during the present year, and that it would not care to be without the outfit at any price if this could not be replaced. At the end of the haulage contract the small body was removed and the truck is now used with the semi-trailer for general commercial work.

## KNIGHT ENGINE IN TAXI CABS.

The Toledo Transfer Company and the Yellow taxicab companies of Cleveland, Cincinnati, Columbus and Toledo have each installed a number of Willlys-Knight limousines in their service. In England the Knight motor has long been established in the taxi service, the London Omnibus Company, which is the largest corporation of its kind in the world, having a fleet of 3500 cars all equipped with the engines.

A. B. Uhl of Toledo, who owns a controlling interest in the American companies referred to, in speaking of the reasons that prompted him to install Knight engined cars in his service, says:

"Ability to come closer to 365-days-in-the-year operation than any other car in our service, naturally has made these cars the leading part of our equipment. The simplicity of their motor mechanism makes for minimum repairs. In a Knight-motored car there are no valves to grind; no adjustments to make; and no carbon to clean out for Knight motors run more smoothly as they accumulate carbon.

"Add to this the economy of operation, ability to run almost continually, and their improvements with constant use—the quietness and flexibility of their motors, coupled with the beauty and grace of their body lines, which have made them most popular among our trade."

## SMITH COMPANY EXPANDS.

The Smith Motor Truck Corporation, which recently acquired the business of the Smith Form-A-Truck Company of Chicago, manufacturer of units for converting Ford chassis into trucks, is expanding its field of operations through the production of truck forming attachments that can also be used for converting Dodge, Maxwell, Buick, Overland and Chevrolet cars, as well as Fords.

This expansion of the business, which was made possible by the introduction of new capital as the result of the recent reorganization, also includes additions to the plant which will afford double the present floor space when completed.

The present capacity of the plant is 300 Ford units and 100 Universal units, as these are known that are designed for other chassis. The unit for Maxwell and Chevrolet chassis has a four-inch channel frame section and sells for \$350, the same price as those for Fords, but the units for the larger machines have a five-inch channel frame section and are designed for loads of 1500 pounds.

## IMPORTS OF TIRES IN INDIA.

The imports of tires into India for 1915-16 show a big increase and also that the Italian and Japanese exporters are getting a large share of the business. During that period Italy exported tires to the value of over \$400,000 into India as compared with about \$30,000 worth during the previous corresponding period. Japan has sent more than \$200,000 worth of tires to India so far this year.

## TRUCK VALUE IN RURAL DELIVERY

Cost of Distribution of Wholesale Grocer Much Reduced,  
Time Saved and Buying Stimulated by Better Service.

COUNTRY transportation is not by any means as well understood as that in cities and suburbs, mainly from the fact that haulage is between terminals or different points of distribution or consumption. Naturally the long haul is regarded as being the most economical, or perhaps the least expensive would be a better expression, but country highways are not as a rule as much improved as the streets of the municipality nor as well maintained, and while paving may be believed to be more destructive of mechanical construction than road surface for driving over, there are heavier grades and the actual operating cost is more.

By this is meant that though city and suburban streets may necessitate greater wear of the machines and larger cost of repair, in the country there will be usually increased consumption of gasoline, oil, grease and tires, especially during the seasons when the highways are rough. What may be considered to be country conditions may be found in communities in the South and West, where the populations may be comparatively small, and yet relatively large distributions are made than from towns and cities that are larger and better known.

An extremely interesting instance of country service is that of the Southern Grocery Company, Henderson, N. C., which operated a single two-ton Corbitt truck for the delivery of goods to its customers. Henderson is not a large town, but it is of decided importance in northern North Carolina, and the company, which had shipped its orders by freight, express and horse wagons, using two teams of animals until the first of the present year, serves a zone of approximately 20 miles radius. The country is rolling and hilly and the roads are

sandy, being characterized as from fair to heavy, and by no means comparing with the hard surfaced highways of the so-called systems of the northern states.

Better serving customers, to stimulate buying, to minimize, if not eliminate, freight and express charges, were objects sought in purchasing the truck, and a unit that would carry a sufficient load to serve any of the routes with frequent buying was selected. The result, however, had been a material saving as compared with horse delivery, to say nothing of the gain in time and the realization of all of the service objects specified. At the end of 11 months the repair bill for parts had been 75 cents—the cost of a new gasket for the intake manifold, and the other expense had been for wages, fuel, lubricants, supplies, etc., incidental to continuous use. The machine had been driven upwards of 50 miles daily. The company has kept a very accurate record and it has made comparisons of cost that prove that the machine has been an exceptionally profitable investment.

An example of the regular work is made of the afternoon trip of Oct. 16, when the machine delivered goods weighing 3900 pounds to a customer 16 miles from the store, the weather conditions being fair and the roads being heavy and sandy in part. The return was made without freight. The expense of the delivery was \$4.04, according to the records, the cost per 100 pounds \$0.103, and the cost a mile was \$0.126.

## GARY CAPITAL INCREASED.

The capital of the Gary Motor Truck Company of Gary, Ind., has been increased from \$25,000 to \$50,000.



Two-Ton Corbitt Trucks Used by the Southern Grocery Company, Henderson, N. C., Replacing Two Teams of Animals and Doing Increased Work.

## FAST HAULS OF HEAVY FREIGHTS

### Large Tonnage Transported by Light Trucks Show the Economies of Speed and Quick Handling of the Loads.

**W**ORK accomplished in the event of emergency is not the measure by which may be judged the possibilities for practical continuous service, and for that reason statements that relate to a specific instance in the use of motor trucks are not as satisfactory as those that cover a period of time. Not only this, where the work is done by men included in an organization the results may be accepted as being what may be expected as an average.

There is, moreover, a vehicle unit that may be utilized more economically than others of greater or lesser capacity, but commercial production of machines will not justify the designing of types to meet every specific requirement. However, the industry produces trucks in the smaller sizes that are but slightly different so far as capacities are concerned, and the variance in operating cost is comparatively slight.

One of the largest producers of small sized trucks or wagons is the Autocar Company, Ardmore, Penn., which has built but one type during its active existence in the industry. Statement is made by the company that its experience has been practically a continuous demonstration of the general utility of vehicles having capacity of 3000-4000 pounds. While this size was first believed to be suited to the requirements of department stores, express companies and retail merchants, it has been found to be equally useful for work for which vehicles of larger sizes have been used.

By this is meant that fast time and not larger loads have been productive of very substantial economies, so that there is a considerable proportion of contractors and coal dealers represented among the owners of more than 4000 Autocars now in service in this country. Assuming that the work is of general character, the 4000-pound machine has

been proven by experience to be extremely economical because the chassis is light, which makes for increased speed and is a large factor in the reduction of operating costs.

Not only this, the smaller machine may be driven faster in congested traffic and handled quicker in small areas, which quality appeals to those who desire faster delivery, and with equipment designed for rapid discharging very little time is lost, for the loading can be controlled very largely by the owners. One particular service in which Autocars have been used with especial economy is hauling brick, and the figures given have been computed by the Fields Brick Company, Chester, Penn., which operates a considerable fleet of these machines. These cover a period of 12 days in May of the present year. These records show surprising possibilities, as follows:

	Miles	No. of Brick	Weight in Pounds
May 9.....	40.4	14,000	70,000
May 11.....	50	15,000	75,000
May 12.....	46.6	15,000	75,000
May 13.....	54	16,000	80,000
May 15.....	58.6	13,000	65,000
May 17.....	77	17,000	85,000
May 18.....	46.7	15,000	75,000
May 19.....	52	12,000	60,000
May 20.....	27	7,000	35,000
May 22.....	50	15,000	75,000
May 24.....	47	14,000	70,000
May 25.....	50	12,000	60,000
Total.....	599.3	165,000	825,000
Average.....	49.94	13,750	68,750

Briefly examining these figures one finds that the smallest day's haulage was 7000 brick, and the largest 17,000; that the smallest day's mileage was 27 and the largest 77; the smallest tonnage was 35,000 pounds and the largest 85,000; that including the short day the average number of brick carried was 13,750, yet this average was exceeded on eight of

the 12 days. In fact the largest tonnage was hauled the day the mileage was greatest of the 12. The record shows, however, what may be regarded as probable fluctuation of the demands, for the hauls differ very much.

An interesting demonstration of the efficiency of the machines of this size was made in Philadelphia during the winter of 1915. John Wanamaker stored thousands of tons of coal in the open and the company that was awarded the contract for delivering this fuel not only used its own fleet of 20 Autocars, but hired a number of others from one of the large contractors of that city. The experience was that the speed of the comparatively light trucks far out balanced the larger units in cost per ton delivered. Incidentally, statement is made by the manufacturer that Autocars are today used in more than 250 different classes of business.

#### GMC HAS ASSEMBLY SYSTEM.

The General Motors Truck Company at its plant in Pontiac, Mich., has adopted the track method of assembling machines. This is the first instance where a truck manufacturer has adapted that system to turning out its product. It was previously thought that because of the heavier construction and more attention in assembling believed to be required, the system that is so generally used in constructing light pleasure cars could not be applied. But the truck chassis at the Pontiac plant roll off the assembly tracks, receive a supply of fuel, water and oil and are driven to the testing stations.

#### PACKARD COMPANY CHANGES.

A number of important changes in the administrative and selling organization of the Packard Motor Car Company have been announced by President Alvan McCauley. H. H. Hills, formerly sales manager, has been appointed assistant general manager of the company, and C. R. Norton, formerly manager of the truck sales department, succeeds Mr. Hills. G. R. Bury, who has been manager of the carriage sales, has been appointed assistant to Mr. Norton. All three men have been with the Packard company from seven to nine years.

#### WANTS SOLE USE OF NAME.

The Cadillac Motor Car Company of Detroit, Mich., has brought suit against the Cadillac Motor Truck Company of Cadillac, Mich., asking for an injunction to restrain the defendants from using the name of "Cadillac." The plaintiff also asks damages, which are alleged as the result of the truck company's use of the name.

The United Motors Company, Grand Rapids, Mich., manufacturer of United trucks, have appointed A. R. Ruggles factory manager.



Autocar Used for Brick Haulage by the Fields Brick Company, Chester, Penn., Carrying Large Tonnage and Making Long Daily Mileage.

## WILL MANUFACTURE BAKER STEEL WHEELS.

The United States Wheel Corporation of Chicago, which absorbed the Baker Wheel and Rim Company, expects to start production of the new Baker pressed steel wheel shortly after the first of the year. A site for the plant has not been selected as yet, but the work will be partly contracted for from pressed steel specialists. The wheel, which is the invention of Erle K. Baker, who invented the Baker split rim that is used exclusively by the General Motors Company, is made from one piece of circular steel from which the rim and spokes are stamped. These wheels weigh about the same as wood artillery wheels of the same capacity and are designed for use on pleasure cars, trucks and tractors. Like the wire wheel, the Baker wheel carries its load in suspension. A number of automobile manufacturers are now testing sets of this equipment.

The United States Wheel Corporation will be headed by Charles G. Hawley of Chicago, who represents extensive financial interests in the company. Joseph A. Anglada, consulting engineer of New York City, will be vice president and active in the management of the company, and Mr. Baker will be secretary.

## CHAMPION DELIVERY TRUCKS.

Ten Champion delivery chassis, manufactured by the Champion Motors Company, were recently run through the streets of Fulton, Ill. The Champion Motors Company was recently organized by Cleveland interests headed by W. L. Widlar, N. R. Wildman and William Grief, with capital of \$5,000,000, and it will manufacture a 1000-pound and 1500-pound delivery chassis which will be sold for \$750 and \$775 respectively, equipped with electric starting and lighting system, bumpers, side curtains and other accessories.

W. L. Widlar is president of the company, Mr. Wildman is vice president, Mr. Grief secretary and treasurer and H. D. W. Mackaye, a vice president, has charge of the production.

## WHEEL SALESMEN HAVE AUTOS.

The salesmen of the Sewell Cushion Wheel Company, in St. Louis, Pittsburg, Baltimore, Newark and New York City, are being provided with automobiles. Walter T. Sewell, sales manager of the company, believes that the use of automobiles will not only increase the efficiency of the selling organization, but will result in the saving of considerable lost time and energy.

## KING TRAILER BUYS BUGGY CO.

The King Trailer Company of Ann Arbor, Mich., has bought the business stock and interests of the Ann Arbor Buggy Company and will manufacture trailers for automobiles.

# TRUCKS MAKE MINE SHOW PROFIT

## With Trailer Equipment White Good Roads Machine Replaces 40 Horses and Saves the Owners \$29.50 a Day.

POWER driven equipment for haulage has made extremely profitable a dolomite mine in California that could not previously be advantageously worked because of the extreme cost of transportation. This is owned by the A. A. Haskins Dolomite Company of San Francisco and is located in San Benito county. It is said to be the largest mine of pure dolomite in the United States, the deposit aggregating more than 3,000,000 tons. Dolomite is a carbonate of calcium and magnesium in varying proportions, that is often found as a compact limestone. It is used as a flux by steel works operating open hearth processes and is calcined to make lime.

The mine is 10½ miles from the nearest railroad station and the road to it is said to be one of the worst in any part of the country. The road is very crooked, there are steep and sharp turns with grades from eight to 10 per cent. and from a few yards to 1½ miles long; eight miles of the surface is covered with fine dust from six to eight inches deep, and there are very many chuck holes of differing sizes and depths.

The company first tried horses for hauling and found that one animal could deliver one ton of dolomite every 24 hours. A freight car load is 40 tons minimum, and to make a car shipment a day five eight-horse teams, five carts, five drivers and stable help were necessary. Smaller shipments were not profitable and the cost of horse haulage was found prohibitive and was abandoned. Next a truck was tried that could not be operated efficiently because of the rough road.

Then the company experimented with a White Good Roads truck, and a five-ton trailer, the truck and trailer carrying 10 tons. The company had numerous long term contracts, but the cost of

transportation must be reduced. The White truck and trailer was found to be in every way practical. The machine is worked 24 hours a day with two drivers, and the daily mileage is 84, which may appear to be comparatively small, but the drivers are required to drive not more than an average of five miles because of the condition of the road, tonnage and dependability being more essential than speed. The loading is done by gravity from a chute on the side of the mountain below the mine, and but three minutes are required to take on a full freight for the truck and trailer.

Reaching the chute is very difficult, for the machine must climb an ascent of 10 per cent. that is covered with 12 inches of dust. When the truck has very nearly reached the top there is a 40 per cent. turn directly under the chute, and after getting over the crest there is a steep drop to the road that can only be made in low speed. There are no brakes on the trailer and the truck must hold the 10-ton load. A short distance from the railroad station the road is for a quarter mile across the deep sand and gravel bed of the Salinas river, which is always dry in summer. The road at this point is packed with straw to obtain better traction.

The cost of hauling 40 tons of dolomite with the truck and trailer averaged \$28.71 daily, and it uses 44 gallons of gasoline and four gallons of oil. During the day 12 gallons of gasoline is used to the round trip and 10 gallons at night, the summer days being extremely hot and the nights comparatively cool. The cost of hauling the same tonnage with horses was \$58.21 for a daily average, so that the truck is an economy worth \$29.50 a day. In seven months' service the truck earned its cost besides affording service superior to what could be obtained with animals.



White Good Roads Truck and Trailer Hauling 10-Ton Loads of Dolomite Over Worst Roads in California—It Paid for Itself in Seven Months.



## TRACTOR FOR RURAL HAULS

### Large Loads Distributed in Northern Michigan in Wide Zone of Operations at Surprisingly Small Tonnage Cost.

**E**SCANABA, Mich., is one of the important cities of the northern peninsula, on the shore of Lake Michigan and not far from the Wisconsin state boundary, and being reached by water routes from all parts of the Great Lakes and a railroad terminal it is a commercial centre of considerable importance, although the population is approximately 16,000. Inland from the city are a number of small villages and towns that receive a great deal of their supplies from Escanaba by rail or by wagon.

One of the large business houses of the city is the A. & J. DeGrand Company, which deals extensively in flour and grain, and because of the large cost of distribution by vehicle, as well as the delay incident to rail or road transportation, the company in the spring of 1914 decided to use a truck. After considering different types a three-ton F-W-D machine was purchased, this having the standard equipment. The experience had been that while the truck might be sufficient for ordinary requirements, there were times when a considerable increase of capacity was desirable, and to obtain what would probably be adequate for any order that might be hauled over the roads during average conditions a trailer of  $3\frac{1}{2}$  tons was bought.

The operating conditions were reasonably favorable, about half of the roads being surfaced with macadam and the remainder being fair dirt roads. During the winter heavy storms are experienced and during the spring the dirt roads are more or less muddy and rutted. The customers of the company regularly served by freight, express and animal vehicle are within a radius of approximately 22 miles, and when the truck and trailer were bought its work was routed for trips that had an average of about 40 miles, one of which was made practically every day.

The belief was that with the trailer

loads that average six tons each could be hauled and distribution made to each customer without greatly increasing the cost of operation of the single truck. There was expectation that the outfit would make quicker deliveries and obviate delays, and hope of economizing as compared with the previous charges for transportation, so a careful record was kept of the cost of operation as well as the freights carried.

The first year the truck and trailer was used 250 working days and the average load was six tons, this being slightly less than capacity. The cost of operation for the period was \$2067.69, which included a depreciation charge of 20 per cent. of the prices of the machine and trailer, and the average cost for mile was 20 67/100 cents, and the cost for the ton mile was 3 45/100 cents.

At the beginning of the second year the company better systematized the service, sending the truck and trailer over a regular route that was 28 miles length, this being maintained throughout the year. The truck was used with one trailer every trip and occasionally with two trailers, as is shown in the accompanying illustration. Part of the time the machine was used with a double shift of men and made three round trips over the route. The average load was seven tons, this being accounted for by the use of the second trailer.

The mileage for 250 working days of the second year averaged 60, and the total cost for the period was, with renewal of all appreciably worn parts and operating expense of every character, including 20 per cent. depreciation, \$3543. This was a cost of 23 60/100 cents a mile and the cost per ton mile was 3 37/100 cents, and the average mileage was larger and the weight hauled was more than the previous year.

Despite the fact that the machine was driven 15,000 miles, and repairs were made, and greater tonnage transported,

the cost was 6/100 less than the first year. One factor that had some bearing was that the haulage was over macadam, save for a half mile of dirt road that was at times very muddy. The truck at the beginning of the third year had been driven 25,000 miles, and statement is made that now, in its third year, it is affording equally good service and at approximately the same cost.

#### NEW BOSTON GARFORD HOME.

One of the largest and most thoroughly appointed and equipped sales and service stations for motor trucks in the country has been opened in Boston, Mass., by the R. E. Taylor Corporation, distributor of Garford trucks.

The building is one story in height and fronts 115 feet on Commonwealth avenue, running back along St. Paul street 288 feet. It is located in the heart of the automobile district and will take care of the company's expanding business for many years to come. It is a fireproof structure of brick, steel and concrete and the exterior is highly decorated with brick, terra cotta and sandstone trimmings.

The branch is under the personal direction of Sales Manager Elmer F. Twyman, Jr., who has been largely responsible for the big distribution of Garford trucks in the eastern territory.

#### A. E. CORBIN AN EXPORTER.

Arthur E. Corbin has resigned as assistant sales manager of the Packard Motor Car Company and joined the Pluym-Ochs Company of Petrograd and New York. He acquired an interest in the firm and will represent it in Russia, where it is expected a big export business will be developed with this country after the war. The concern handles several well known makes of automobiles and the Curtiss aeroplane in foreign countries.

Mr. Corbin spent over 12 years in the automobile industry, starting with the Stevens-Duryea plant at Chicopee Falls, Mass., and later going to the Packard company, where he has been for the past nine years.

#### C. L. DUPUY PROMOTED.

C. L. DuPuy has been appointed southern division sales manager of the Selden Truck Sales Company of Rochester, N. Y. His territory will comprise the states of Georgia, Florida, Alabama, Mississippi and Louisiana, with headquarters in Atlanta, Ga. Mr. DuPuy has sold Selden trucks in Atlanta, Ga., for the past five years.

#### ROWE COMPANY'S DIVIDEND.

The Rowe Motor Manufacturing Company of East Downingtown, Penn., has declared a dividend of five per cent. on outstanding preferred stock, payable on Jan. 1 to stockholders of record.



F-W-D Three-Ton Truck, Used with One and Two Trailers for Delivery by the A. & J. De Grand Company, Escanaba, Mich., with Much Economy.



# SMITH MOTOR TRUCK CORPORATION OFFICERS.

At a recent meeting of the stockholders of the Smith Motor Truck Corporation, the following directors were elected: A. D. Smith, E. I. Rosenfeld, A. G. Hanauer, J. M. Hoyt, C. B. Little and Louis Hennock.

The Smith Motor Truck Corporation owns the entire capital stock of the Smith Form-A-Truck Company, a Delaware Corporation. The controlling company is incorporated in Virginia, with capital stock of \$14,000,000, divided into \$2,000,000 of preferred and \$12,000,000 common, of which \$1,400,000 preferred and \$10,000,000 common has been issued, the balance being retained as treasury stock for future use as occasion requires.

The offering of stock made to the public was twice over subscribed. After June 30, 1917, and prior to Jan. 1, 1920, one share of preferred stock may be exchanged for 10 shares of common stock. A sinking fund of five per cent. a year will retire the preferred stock at 120 a share, beginning Jan. 1, 1920.

## WINTHER COMPANY TO BUILD.

The Winther Motor Truck Company of Kenosha, Wis., recently incorporated with capital of \$350,000, will build a large factory for the manufacture of commercial trucks in that city.

## FEDERAL SALES ACTIVITIES.

B. F. Wright, chief engineer, and E. A. Haskins, service manager of the Federal Motor Truck Company, Detroit, Mich., recently visited Pittsburg, Penn., where they inspected one of the Federal five-ton experimental models.

J. E. Bowman has returned to Detroit after a visit in the New England territory, where he gave a number of talks to Federal dealers on sales organization.

L. C. Long, formerly Federal New England sales manager, and later special representative and previously vice president and city sales manager of the Chicago branch, has returned to the latter position. Adolph A. Geisel is now Federal sales manager for New England. He was formerly with the Federal Motor Truck Company and later with the Martin Fifth Wheel Company.

R. E. Arter of Newport, R. I., has been appointed general manager of the Federal Motor Truck Company of Providence, R. I.

# TRUCK TYPE AND SIZE ECONOMY

## Ratio of Service Values of Two Packard Machines Operated in the Distribution of Metal Castings.



Four-Ton Worm Driven Packard Truck Used by the Falk Company, Milwaukee, Wis., in the Delivery of Its Products.

THE superior economy of a Packard worm driven motor truck over a chain driven vehicle was definitely determined by The Falk Company, manufacturer of steel castings in Milwaukee, Wis., by a set of daily records compiled during the months of May, June and July of this year. Both trucks were Packards and the firm considers the results of unusual significance, as it cost only \$33 more to operate the worm drive, a four-ton vehicle, than it did the chain drive of only two tons capacity. The plant is located in a depression con-

siderably lower than the adjacent territory to which the trucks have to ascend with loads. This makes the heaviest part of their work uphill hauls.

The records kept for the three months include miles, pounds hauled, gasoline, oil, driver's time and mechanic's time for each month. They show that the two-ton chain drive truck, which by the way is nearly three years old, averaged 6.07 miles to the gallon of gasoline, cost a total of \$392.70 for the three months and was on the road practically the same time as its bigger companion. The cost per mile of the chain drive was 14 cents and the cost per ton 64 cents. The big four-ton worm drive in the three months cost only \$33 more, or to be exact, \$425.65, and in the time specified hauled nearly twice as much in poundage and traveled 500 miles less. Its cost per mile was 20 cents, only six cents more than the other truck, but the cost per ton was only 42 cents, a reduction of 14 cents for each ton.

The detailed records for the two trucks are shown on this page:

It is not claimed at all that these figures are typical of Packard economy, but merely that they are an example of how cheaply this make of truck will haul heavy loads up grade.

## ASKS REDUCTION IN TAX,

The White Company of Cleveland, O., has filed a request for a reduction of taxes with County Auditor Zangerle, which the latter has refused. The auditor added \$5,000,000 to the White company's assessment, claiming that it represented the amount that good will figured in the concern's assets.

### Two-Ton Chain Drive Packard.

	Miles	Lbs. Hauled	Gasoline	Oil	Driver's Mechan- Time Hours	Time Hours
1916						
May	955	432,500	173	51	297 1/4	54
June	900	434,700	145	26	294 1/2	24 1/2
July	826	349,700	123	28 1/2	282 3/4	39
Total	2,681	1,217,900	441	105 1/2	875 1/2	117 1/2
Average miles per gallon gasoline						6.07
Average miles per gallon oil						203.2
Cost of labor at 30 cents per hour						\$297.90
Cost of gasoline at 20 cents per gallon						88.20
Cost of oil at 50 cents per gallon						6.60
Total						\$392.70
Cost per mile						\$0.146
Cost per ton						\$0.644

### Four-Ton Worm Drive Packard Purchased Jan. 17, 1916.

	Miles	Lbs. Hauled	Gals. Gasoline	Pts. Oil	Driver's Mechan- Time Hours	Time Hours
1916						
May	751	777,900	225	38 1/2	308 3/4	36 1/2
June	707	695,200	202	17	299 3/4	29
July	655	527,888	176	21 1/2	295	36
Total	2,113	2,000,988	603	77	903 1/2	101 1/2
Average miles per gallon gasoline						3.5
Average miles per gallon oil						219.2
Cost of labor at 30 cents per hour						\$301.50
Cost of gasoline at 20 cents per gallon						120.60
Cost of oil at 50 cents per gallon						2.55
Total						\$425.65
Cost per mile						\$0.201
Cost per ton						\$0.425

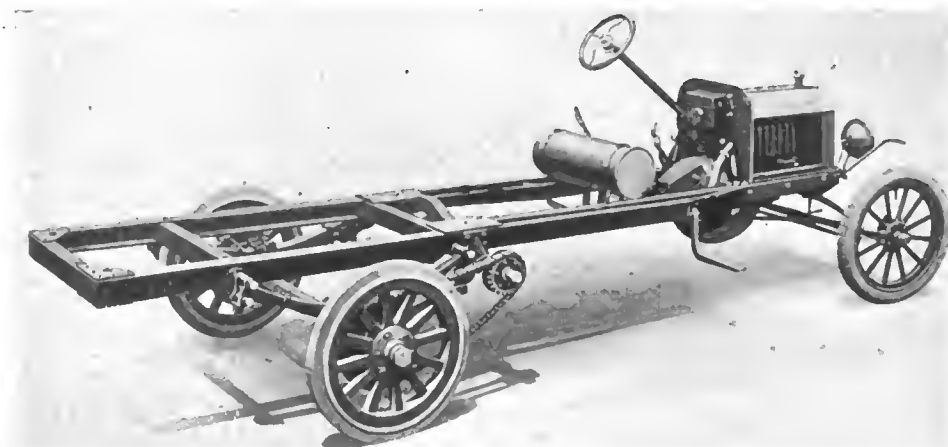
## THE TONFORD TRUCK CONVERSION UNIT.

CONVERSION units, by which pleasure car chassis may be transformed into vehicles practical for hauling light freights, have been found by experience to be enduring and economical, and there are those

considerable numbers. The production is constantly increasing, because of the frequent expansions of the factory to meet the demands as the distributing organization of the company is extended, and there is

reason to believe that there will be continued growth, for the plans comprehend active representation in every commercial centre.

The Tonford unit consists essentially of a dead rear axle on which a pair of heavy wheels are mounted, a pair of springs and a pair of radius rods, and a frame that is combined with that of the Ford chassis, and the rear axle of the chassis is converted to a jackshaft through which the vehicle is driven by sprockets and chains extending to each of



The Tonford Truck Conversion Unit Attached to a Pleasure Car Chassis, Making Its Freight Carrying Capacity 2000 Pounds.

who maintain that the most logical and sensible use that can be made of cars that, although no longer desirable for pleasure purposes because of appearance, are serviceable and may be worked for periods sufficient to justify the expense of converting them.

This statement applies to smaller machines, that when converted may be used for fast delivery purposes, because when large loads are hauled in all conditions and over roads of all kinds very substantial construction is necessary, and strength is a prime essential. This, however, cannot be obtained without completely rebuilding, and even were this done the vehicles would be makeshifts compared with those designed and built for hard work. Not only would the first cost be considerable, but there would be relatively greater maintenance expense, which is one of the costs that must be minimized to obtain economy.

The simplicity and practicality of the Ford chassis, and that the engine has large power production, are two factors that first impelled owners to convert them for freight haulage, and the relatively small cost and the low operating expense led to the commercial production of units that could be combined with the machines to adapt them for general transportation of light loads.

One of the best known of these units is the Tonford, produced by the Detroit Truck Company, Detroit, Mich., which has a well equipped plant and is building them in

the rear wheels. Of course there is a practical braking system. The idea of the unit is simple enough, but what required great care in developing a design was to afford ample strength with minimum weight, to eliminate every part possible to obtain simplicity and accessibility, to have the moving parts practically protected and to insure sufficient lubrication. This development necessitated experimental work of a very general character, for the desire was that the units should be so built that they would endure in every service in which they could be used.

### Conversion a Quick and Easy Work.

The preparation of the Ford chassis is a work that can be undertaken by any owner, even if he has no mechanical experience. Four holes are drilled in the frame into which are fitted the bolts that complete the assembly, and when these have been seated the rear axle is quickly converted into a jackshaft and this is installed in the brackets and the sprockets adjusted.



Ford Chassis, converted with a Tonford Unit Into a Practical Tank Truck for the Distribution of Gasoline for Fuel.

The chains are next put on and the radius rods coupled, and the work is complete.

The frame is constructed of two side, rear end and



**Rear End of a Chassis Converted with a Tonford Unit, Showing the Attachment of the Ford Car Frame.**

two cross members, that are of heavy pressed steel channel section with wide webs to insure strength. The forward ends of the side members are "necked" or curved inward, the frame being wider than that of the Ford chassis, and the ends are formed so that the side members of the Ford chassis frame may be telescoped through the channels to the dash. The ends are secured by bolts to the Ford frame, the frames reinforcing each other. The two cross members of the frame are fitted to reinforce it at the spring hangers, and these and the end member are strengthened by heavy gusset plates.

#### **Retained by Two Heavy Plates.**

The rear end of the Ford frame extends nearly to the forward cross member, and two rectangular plates that are riveted to the unit frame and the cross member are bolted to it, so that the assembly is extremely solid and substantial. Between the plates is the rear member of the Ford frame, which is cambered, and there is in effect two cross members, and a double frame from this point forward to the dash. The spring hangers are heavy and are riveted to the frame members, the cross members affording secure anchorage and insuring against twisting or distortion. There is need of this rigidity, for the springs are shackled at both ends and there is necessarily stresses at every deflection and reflexion of the springs.

The jackshaft is the original Ford rear axle with the wheels removed from the driving shafts. On the taper ends of the shafts sprockets are keyed and secured by locked nuts, and the housing ends are rigidly clamped in brackets, the upper section of which are bolted to the unit frame side members under the original rear end frame member of the Ford chassis. The lower sections are secured by locked nuts and may be removed quickly whenever necessary. This manner of installing the jackshaft also greatly stiffens the frame at this point. The brake flanges or spiders are retained on the axle housing and the sprockets are built with hubs on which the toothed members are bolted. The toothed members can be renewed whenever worn.

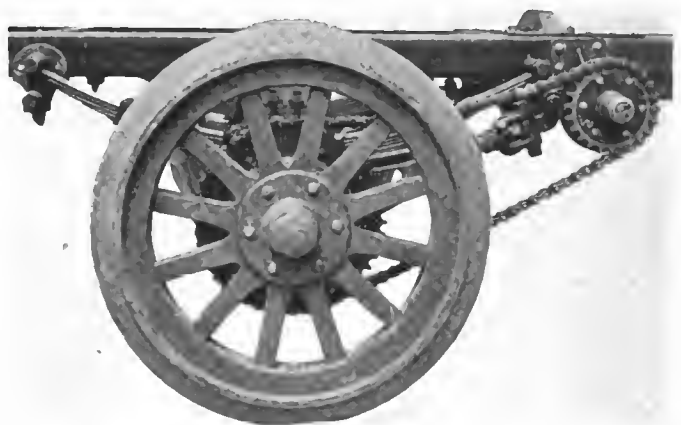
The units are built so that when assembled the

chassis will have wheelbase of 127 inches, or 27 more than the original Ford machine, and it may have rear tread of 56 or 64 inches. The rear axle is a steel drop forging that is  $2\frac{1}{8}$  inches square and is guaranteed to endure a load of 3000 pounds in any operating condition. On this the 12-spoked wooden artillery type wheels are mounted on Bower roller bearings, the bearings being designed to sustain loads of 7500 pounds, so that there is a factor of safety that will never be reached. The unit is designed to carry 90 per cent. of the load, and with a normal freight of a ton the total weight on the rear axle would be 1800 pounds.

#### **Radius Rods Take the Stresses.**

The rear axle carries the rear ends of the radius rods, which are rotatable on seats, and the forward ends are secured to the jackshaft and are pivoted so that there is practically universal action. These rods take the driving and torsion stresses. The rear wheels are shod with solid tires. The rear wheels are driven by standard type block and roller chains that are designed for vehicle propulsion. The rear wheels are fitted with large internal expanding brake shoes that are stated to have unusual efficiency, and these are connected with rods that are coupled with the regular Ford emergency brake. The service brake is actuated by foot pedal and the control of the machine is unchanged.

Claim is made for this unit that a pleasure car can be converted to a truck or reconverted into a pleasure car at comparatively little expense and in a short time whenever such changes are desired. In doing this work the car body is unbolted and it may be lifted and carried backward off the chassis onto horses. The rear fenders are next taken off. The frame is then jacked, the brake rods loosened at both ends and taken out of the supports or guides. Next the rear spring is unbolted from the frame and the clips are removed, the spring being taken out, leaving the rear axle and wheels clear. The wheels are then removed from the



**The Heavy Wheel, Chain, Driving Sprockets, Radius Rods and Spring Suspension of the Tonford Unit.**

axle shafts and the axle is ready for installation as a jackshaft. When this has been done the Tonford unit may be attached in manner that has been described.

## UTILITY OF TRUCKS ON FARM.

### Michigan Man Hauls Agricultural Machinery in Fields Reaping Crops.

Motor trucks cannot be used practically on soft ground because of the need of having traction if a load is to be carried or hauled, but they can be worked extremely economically in conditions that would be regarded as unfavorable if not impossible. This statement applies equally well with reference to agricultural work as well as highway haulage, and there is little doubt that machines could be used for a considerable part of the work now done with animals on farms.

The main point emphasized is that farmers who have sufficient haulage work to justify investment in trucks can still further utilize them in fields where the surface will afford traction for the wheels when the machines are loaded. This statement is borne out by the experience of Ira Wilson, a farmer living near Redford, Mich., who operates a large farm and deals extensively in dairy products. He collects milk from producers and hauls it to market and to railroad stations, and he utilizes seven two-ton Reo trucks practically every day in the year.

While these machines are required for the collection and haulage they are not in use all of the time and when not needed for work on the road Mr. Wilson utilizes them in the fields of his farm whenever possible to do so. The accompanying illustrations show a truck hauling a hay loader and wagon into a field preparatory to loading, and the loader in operation and the wagon partly loaded. The tongue of the hay wagon is so coupled to the truck that the wagon may be backed into the barns, the wagon being used so that there shall not be need of taking a truck into a barn.

Mr. Wilson does not permit motor power of any description in his buildings, as he believes this is the best practical safeguard against fire. When the wagons are hauled to the barns the trucks are taken a reasonable distance from them. Mr. Wilson's garage, in which is stored the seven trucks and two cars, is well isolated from the farm buildings. With the trucks hauling the wagons and loading machinery, and large crews of men to load them, a great deal of work

is done and the number of horses that might ordinarily be required are dispensed with.

### NEW YORK MAIL SERVICE.

The recommendation by Postmaster-General Burleson that motor trucks be substituted in New York City for the present pneumatic tube service in the postoffice department, has created a storm of agitation among New York merchants. In opposing Mr. Burleson's plan nothing derogatory to the reliability or effectiveness of the automobile service is claimed, but the remonstrants want the pneumatic service retained as additional means of service. The congested traffic conditions, it is believed, would make handling the entire bulk of New York City mail by truck problematical as regards efficient service.

The postoffice department made investigation and finding that the substitution of power trucks in handling the mail would effect an enormous saving, recommended the abandonment of the pneumatic tube service.

### HERBERT CHASE IN S. A. E. OFFICE.

Herbert Chase, treasurer of the Society of Automobile Engineers and member of its council, has joined the office staff of the organization. He was formerly connected with the Automobile Club of America for several years as laboratory engineer and chief engineer.

Mr. Chase received his preparatory engineering education at the Pratt Institute and he graduated as a mechanical engineer from Sibley College, Cornell University, in 1908.

### F-W-D COMPANY INCREASES PRODUCTION.

The production at the plant of the Four Wheel Drive Company, Clintonville, Wis., has been increased to four trucks a day and it is expected that the production will have been increased to six a day by the first of the year. Additions to the plant are being rushed and new equipment is being installed as fast as it can be secured. With a standing order for 20 trucks daily for export business and a large domestic demand the company is way behind on deliveries.



Reo Trucks Operated Instead of Animals on Michigan Farms: At Left, Coupled to a Wagon and Hay Loader; at Right, the Truck at Work and the Machine Loading.

## CORBITT WORM-DRIVEN TRUCKS

*Series of Six Chassis, from 1500 to 7000 Pounds Capacity, Constructed of High-Grade Standard Units to Design Proven by Service.*

**O**PERATING what is stated to be the largest motor vehicle manufactory in the South, the Corbitt Automobile Company, Henderson, N. C., produces six different sizes of truck chassis, these being

nized as being standard products, and they are assembled to designs that are created with the purpose of obtaining high efficiency and minimum operating expense and long endurance.

The series of trucks may be regarded as being built to a single design, although they differ slightly in detail. They are all equipped with worm shaft and worm wheel rear axles, they are driven by the Hotchkiss system, the rear springs absorbing the torsional stresses and driving thrust, and in every way they are conventional constructions. The quality of the machines may be best illustrated by the statement that they have unit power plant suspended on sub-



**Model G, 1500 Pounds Load Capacity, Corbitt Chassis, Equipped with a Body Especially Designed for Bottlers' Delivery.**

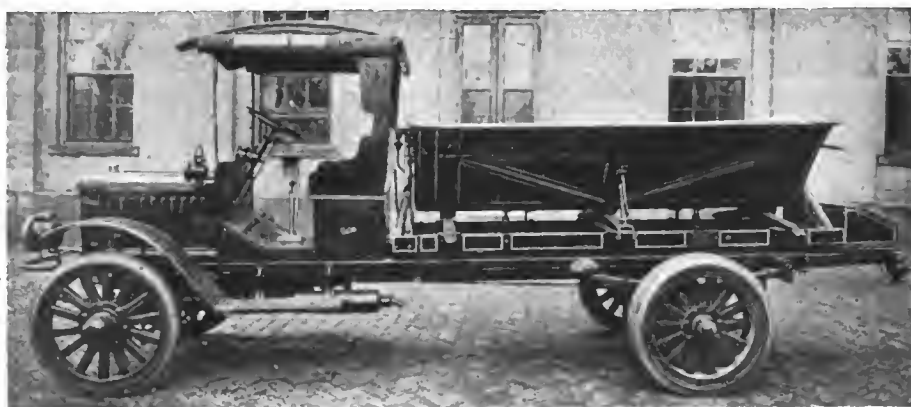
1500, 2000, 3000, 4000, 5000 and 7000 pounds load capacities. Henderson, although it is regarded as being in the South, is located not far from the Atlantic Coast and close to the Virginia boundary, a comparatively short distance from Newport News, Va., one of the great shipping ports of the country, and on the main line of one of the most important southern railroads. The statement made is desirable because of the possible assumption that the company is producing trucks in small numbers and is remote from large commercial centres.

Although established for a considerable period, the principal market of the company until recently has been, in the South and Southwest, and now it has sought to extend its activities into the Northern and New England states, having the production facilities and resources to justify any expansion that conditions will demand. The factory is large, is well equipped and is carefully systematized and organized.

The company has established a policy that is quite general in the industry, purchasing and assembling the units that are produced by some of the best known specialists of the industry. These are proven components, the qualities having been conclusively shown by continued service, that have been developed by careful engineers to meet the exacting requirements of those who use highway transports. These units are recog-

nized, the rear axles Sheldons, and the other units are equally high grade. The 7000-pound truck is fitted with a Hele-Shaw type multiple disc clutch and a Cotta transmission gearset, but the other chassis are built with Brown-Lipe multiple disc clutches and transmission gearsets. The driving system includes Hartford shafts and universal joints, or Blood Bros. universal joints, and Ross steering gears, Eisemann magnetos, Stromberg carburetors and Pierce governors are used in the equipments.

Five different size engines are used, that of the 1500-pound chassis having bore of  $3\frac{1}{2}$  inches and stroke of five inches, rated at 19.61 horsepower by the S. A. E. formula; that of the 2000-pound chassis having bore of  $3\frac{3}{4}$  inches and stroke of five inches, rated at 22.50 horsepower by the S. A. E. formula; that of the 3000-pound chassis having bore of  $3\frac{3}{4}$  inches and stroke of  $5\frac{1}{4}$  inches, rated at 22.50 horsepower by the



**Model B, 5000 Pounds Load Capacity, Corbitt Chassis, with a Lee Quick Discharging Body Installed, Adapted for Hauling Bulk Material.**





Model E, 2000 Pounds Load Capacity, Corbitt Chassis, Complete, Ready for the Installation of Any Type of Body.

S. A. E. formula; that of the 4000-pound and the 5000-pound chassis having bore of  $4\frac{1}{8}$  inches and stroke of  $5\frac{1}{4}$  inches, rated at 27.02 horsepower by the S. A. E. formula, and the 7000-pound chassis having bore of  $4\frac{1}{2}$  inches and stroke of  $5\frac{1}{2}$  inches, rated at 32.40 horsepower by the S. A. E. formula. The wheelbases of the chassis in the order above referred to are 130, 130, 138, 148, 148 and 168 inches. The rated speed of the chassis in the same order are 20 miles, 16 miles, 13 miles, 13 miles, 13 miles and nine miles. The prices for the chassis in the same order, with standard equipment are \$1100, \$1300, \$2150, \$2400, \$2650 and \$3250.

#### The Unit Power Plant Construction.

The cylinder units of the power plants, save that of the 7000-pound chassis, which are cast in pairs, are cast en bloc, and the engines of the 1500-pound and the 2000-pound chassis are cooled by thermo-syphon systems of water circulation, those of the four larger sizes being cooled by water circulated by centrifugal pumps. These are the principal differences in the construction of the engines.

The following description of the engine of the 7000-pound chassis will apply practically to all of the others, save such differences as have been stated. The cylinder units are cast of a superior quality of gray iron, with the water jackets integral, the water jacket heads being large detachable plates that are retained by series of cap screws. This construction insures uniformity of cylinder wall thickness and perfect clearance of the water chambers, so that the cooling systems will be absolutely efficient. The units are cast with wide flanges and webs that with cover plates will enclose the valve mechanisms.

The crank cases are two section, the upper halves being cast of aluminum alloy with vertical transverse webs to carry

the centre main bearings, with forward extensions that house the timing gearsets and rear extension that form the bell housings for the flywheels. The lower sections of all save the smallest size engine are aluminum castings that form the oil reservoirs and carry the troughs in the bases of the crank chambers into which the connecting rods sweep. The exception stated is a pressed steel section that serves the same purpose. The crank cases are designed to be mounted on forward and rear supporting arms that are cast integral with the upper sections. The lower crank case sections are extended at the rear to house the flywheels.

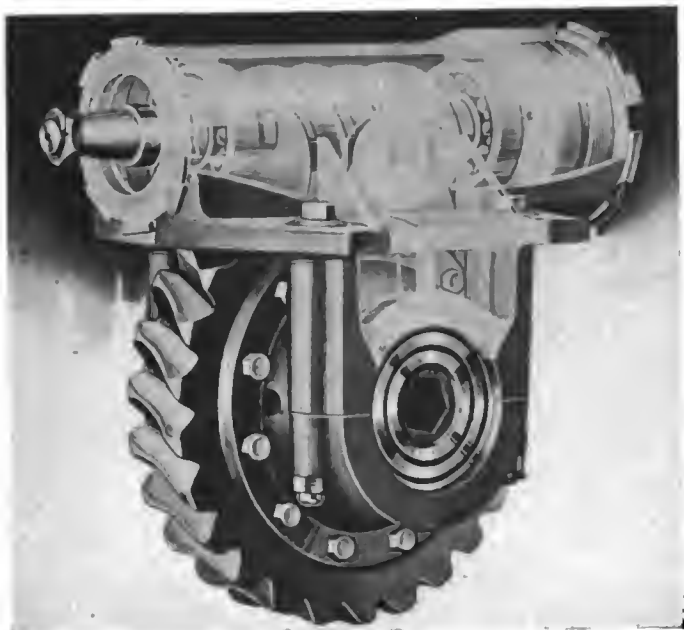
#### The Reciprocating Engine Parts.

The pistons are cast from the same quality of metal as the cylinders and are carefully turned and fitted. They are channelled for three diagonally split eccentric compression rings above the wristpins, and there are five grooves below the wristpins to insure distribution of the lubricant. The crankshafts are drop forged from high grade alloy steel, having three journals, with the flywheel flange and thrust flanges at either side of the centre main bearing forged integral. The shafts have large journals and are specially machined and accurately finished and heat treated. The camshafts are single-piece steel drop forgings, with the cams forged integral, all save the smallest size having three bearings. All the camshaft bearings are liberal sized and the construction is such that by removing the cover of the timing gearset the shafts may be quickly and easily withdrawn.

The machine work on the crankshafts and camshafts is very carefully done and they are balanced on special machines to obtain extreme accuracy. The connecting rods are I section steel drop forgings that are heat treated and are bored and reamed with great care. The wristpins are hardened and ground steel tube that are secured in the piston bosses, the rods oscillating on them. The wristpin holes in the pistons are bored and reamed with special machines to obtain accurate alignment. The caps of the connecting rods are secured with nickel steel bolts with locked nuts.



Type W-21 Sheldon Semi-Floating Worm Drive Axle, Which Is Most Recent Perfection of This Standard Production.



Sheldon Worm Shaft and Worm Wheel Assembly on the Carrier or Cover of the Axle Housing.

The main, connecting rod and camshaft bearings are a special quality nickel babbitt, the main and connecting rod bearings being retained by brass screws and the connecting rod bearings are adjustable with steel shims. The small ends of the connecting rods are bushed with phosphor bronze.

#### The Valves and Timing Gearsets.

The valves are large size and have ample clearance to insure complete scavenging of the cylinders and full charges of fuel gas. They are interchangeable, being made with nickel steel heads electrically welded to carbon steel stems, the lower ends of the stems being hardened to resist wear. The valves operate in long guides that are readily renewable. The valve tappets are a mushroom type, of hardened steel, with adjusting screws and nuts, that are mounted in guides carried in the base flanges that may be renewed when worn. The valves may be enclosed and protected by cover plates retained by wing nuts.

The timing gearsets are constructed with helical cut gears, having wide faces, that are almost noiseless when operated. Much care is directed to obtaining endurance of the gears and correct relation of centres.

#### The Cooling and Lubricating Systems.

The engines are cooled by circulations of water, those of the four largest sizes being circulated by centrifugal pumps, and those of the two smaller sizes having thermo-siphon circulation. The water is carried through the engine water jackets and helical tube radiators of truck construction, these having cast metal top and bottom tanks, that are suspended on springs to prevent stresses from chassis distortion. Radiation is insured by fans that are

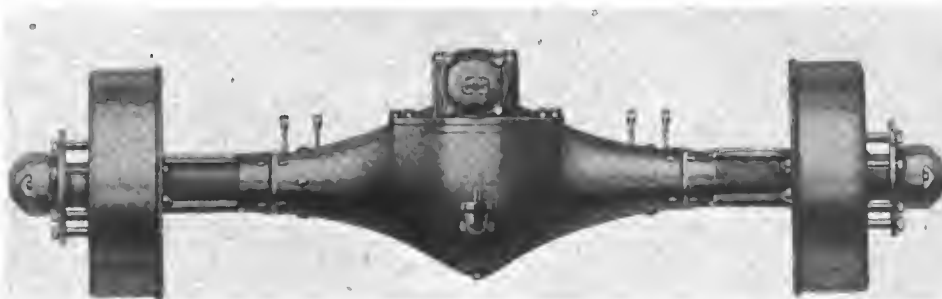
mounted on ball bearings on adjustable brackets that are driven by flat belts from pulleys carried on extensions of the camshafts.

The lubrication systems of the engines are practically the same, the oil being drawn from the reservoir by horizontal or vertical plunger pumps operated by eccentrics from the camshafts, and forced through tube to the timing gearsets and the rear main bearings. The lubricant drains to the bases of the crank chambers and fills the oil troughs, whence it is distributed by the splash of the big ends of the connecting rods to the cylinder and piston walls, the centre and front main bearings, the wristpins, camshafts and valve tappets. Oil pockets cast in the walls of the crank cases supply the camshaft bearings, and there are traps in the ends of the connecting rods that lubricate the wristpins. From the troughs the oil drains to the reservoirs and is filtered before being used again.

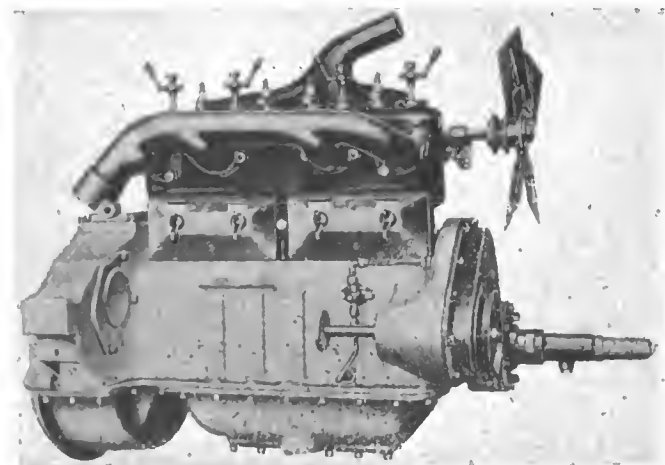
#### The Power Transmission Systems.

The clutches are all multiple disc types, that of the 7000-pound chassis being a Hele-Shaw construction, that are operated in oil, and those of the other chassis Brown-Lipe dry plate designs, that are built for truck service, have ample frictional areas, are easy of engagement and are in every way efficient. All the transmission gearsets are selective sliding gear constructions, having three forward speed ratios and reverse, and the shafts and gears are nickel steel. The gears are wide faced to insure endurance and the large shafts are mounted on annular ball bearings.

The power is transmitted to the rear axles by large shafts with universal joints at either end, the joints being of generous proportions and completely enclosed so that they may be packed with grease. The rear axles are the standard Sheldon semi-floating types. The housings of these axles are made either single unit or sectional, each having a central section with a large cover plate in which is housed the worm shaft, worm wheel and the differential gearset. The shaft, wheel and gearset are assembled as a unit, being mounted on the cover plate, which is known as a carrier. The worm shaft is mounted on annular ball bearings, and the bronze worm wheel is carried on the spider of the differential gearset, the gears and pinions of the gearset being bevel types. The differential gears are mounted on annular ball bearings.



Type W-1500 Sheldon Semi-Floating Worm Drive Axle. This Size Being Used in the Construction of the Model G Chassis.



Model N Continental Engine, with the Cylinders Cast En Bloc and Cooled by Thermo-Syphon Circulation of Water, Showing the Exhaust Side.

The axle shafts are heat treated nickel steel and these are carried by the differential gearset and annular ball bearings mounted in the ends of the axle housings, these bearings being retained by plates that are bolted to the housings. The wheels are keyed to the tapered ends of the axle shafts and are retained by locked nuts. The entire axle is lubricated from within, the central section containing a volume of oil that is distributed by splash to all the moving parts, shafts, gears and bearings. These bearings are built so that they are non-adjustable, and if adequately lubricated they require practically no attention other than occasional flushing of the housings and supplying fresh oil.

#### Other Chassis Construction Details.

The front axles are all drop forgings, those of the 1500 and 2000-pound chassis being a special alloy steel, and of the other chassis chrome vanadium steel, that are forged with the spring seats integral. The steering knuckles are nickel steel and are very heavy, those of the two smallest chassis having steel-bushed yoke ends, and the pivots of the four largest sizes being fitted with annular ball bearings. The wheel spindles are equipped with annular ball bearings. The frames are pressed steel channel sections, of unusual width and with deep webs, having numerous cross members well reinforced by gusset plates. The frames are suspended on semi-elliptic springs, the rear ends of which are shackled, and these are exceptionally long and the leaves are thin to have great elasticity. They are nibbed and slotted to prevent misalignment from side thrust. The springs of the four largest chassis are chrome vanadium steel, and those of the smallest sizes are a special steel alloy. The spring eyes are bronze bushed to compensate for wear.

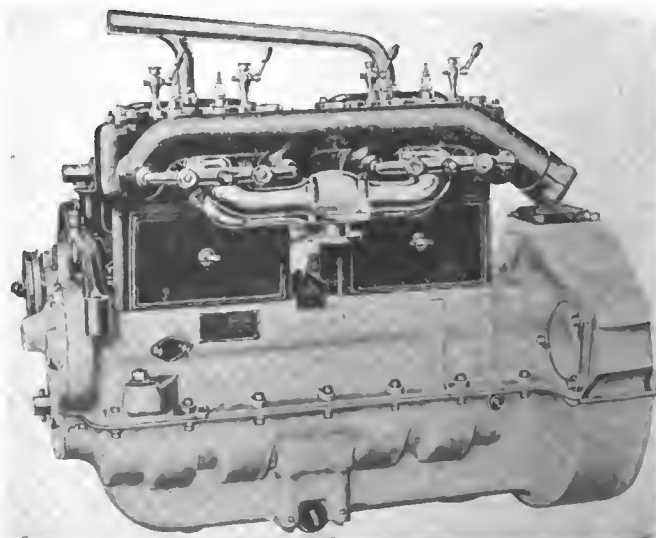
The wheels are wood, artillery type, and these are shod with solid band tires, those of the 1500-pound chassis being 34 by three-inch forward and 34 by 3½-inch rear; of the 2000-pound chassis 34 by 3½-inch forward and 34 by four-inch rear; of the 3000-pound chassis 36 by 3½-inch forward and 36 by four-inch rear; of the 4000-pound chassis 36 by four-inch for-

ward and 36 by 3½-inch dual rear; of the 5000-pound chassis 36 by four-inch forward and 36 by four-inch dual rear; of the 7000-pound chassis 36 by five-inch forward and 36 by five-inch dual rear.

#### The Steering Gear and Control.

The steering gears are Ross construction, designed especially for truck service, those of the 1500 and 2000-pound chassis being worm and sector types and those of the larger chassis being worm and pinion types. These are all built so that compensation may be made for wear. The steering columns are located at the left sides and the linkage is heavy and protected by the front axles from road obstructions. The control is by the usual foot pedals for the clutch and service brake, by hand levers controlling the ignition circuit and fuel supply on the steering column, and by hand levers for gear shifting and the emergency brake in the centre of the footboard. The brakes are extremely large and are very efficient. Those of the 1500 and 2000-pound chassis are double internal operating within drums 16 inches diameter and 2½ inches face on the rear wheels; those of the 3000, 4000 and 5000-pound chassis are internal expanding and external contracting within and on drums 16 inches diameter and three inches face on the rear wheels; those of the 7000-pound chassis are double internal expanding in drums 20 inches diameter and five inches face on the rear wheels.

The chassis are sold with driver's seat, fenders, running boards, tool box, tools, jack, horn and oil dash and tail lamps, and the 7000-pound chassis is also fitted with head lamps, gas tank and hub odometer. The chassis are designed by letter, the 7000-pound being model A, the 5000-pound chassis model B, the 4000-pound chassis being model C, the 3000-pound chassis being model D, the 2000-pound chassis being model E and the 1500-pound chassis being model G. When desired the company will equip the chassis with standard type bodies or will build bodies to specification.



Model E Continental Engine, Valve Side, with the Cylinders Cast in Pairs, Cooled by Water Circulated by Centrifugal Pump.

### WILL ADVANCE EXPORT TRADE.

At the recent meeting of the directors of the National Automobile Chamber of Commerce, the first step in a co-operative movement was taken to advance the export trade in automobiles, motor trucks and allied products.

It was voted to hold a meeting of the export managers of the companies holding membership in the chamber. This meeting will be held in January at the headquarters of the N. A. C. C. in New York City.

The exports of products of the motor car industry in this country have been increasing each year and the figures for this year will exceed \$160,000,000, numbering more than 81,000 cars sent to 74 different countries.

Co-operative work to stimulate the export business will enable the various members to collect information regarding changes in duties in foreign countries, customs regulations, shipping routes and charges, special permits, lists of dealers, banking arrangements, road conditions and general uses for various types of motor cars, possibilities of interesting agents and broadening markets, the handling of trade after the cars have been sold and such other matters as would help to increase the business of the American automobile manufacturer abroad.

### NEW PLAN FOR S. A. E. STANDARDS.

With the approaching formation of the Society of Automotive Engineers, which will include the S. A. E. and other engineering associations and societies in the industries where the internal combustion engine is used to create power, plans for the reorganization of the standards committees are under consideration. Under the new plans the Standards Committee of the S. A. E. will take up work in aviation, tractor and marine engineering, as well as in automobile engineering. Work on the reorganization is being handled by the following committee, which was appointed by the S. A. E. council:

Coker Clarkson, general manager of S. A. E.; A. Ludlow Clayden, chairman of the present Standards Committee; John G. Utz, Perfection Spring Company; K. W. Zimmerschied, General Motors Company; George H. Dunham, Henry Souther, A. I. Horning, Waukesha Motor Company; Charles E. Manly, Curtiss Aviation Company; R. H. Coombs, Prest-O-Lite Company.

It is proposed to have a standards committee head for each of the different fields of engineering and there will be a number of sub-divisions.

The Moreland Motor Truck Company, of which Watt Moreland is founder and treasurer, is planning a \$1,000,000 plant to be erected in Los Angeles, Cal., for the manufacture of Moreland trucks.

### JOY RESIGNS AS PACKARD CHAIRMAN.

At the last meeting of the directors of the Packard Motor Car Company the resignation of Henry B. Joy as chairman of the board was received and accepted. In tendering his resignation Mr. Joy stated that the pressure of other business interests compelled him to relinquish his duties as head of the great motor car industry in which he has been the principal factor for many years. Several months ago Mr. Joy resigned as president of the company and was succeeded by Alvan Macauley.

He will now devote his time to the other business interests, which cover a wide range. He is a director of the Federal Reserve Bank of Chicago, and of the Wabash Railroad, is vice president of Detroit Union Railroad Depot Company, and owns the controlling stock in the Isko, Incorporated, which manufactures electric refrigeration devices. He is also president of the Lincoln Highway Association and in that position has been an active worker in promoting the great transcontinental highway, which extends from New York City to Los Angeles.

At the same meeting of the directors the yearly dividend rate on the common stock of the Packard company was increased from seven to eight per cent. The increased rate becomes effective on the quarterly dividend to be paid on Feb. 1 to stockholders of record Jan. 15.

### MILEAGE OF GOODYEAR S-V TIRES.

Statement is made by C. W. Martin, Jr., manager of the truck tire department of the Goodyear Tire and Rubber Company, Akron, O., that the mileage obtained by more than 700 users of Goodyear S-V tires shows an average of 13,705 a tire to date, which is nearly double the guarantee of 7000 miles, and that many of the tires are good for considerable additional service.

### JAPANESE WILL BUY TRUCKS.

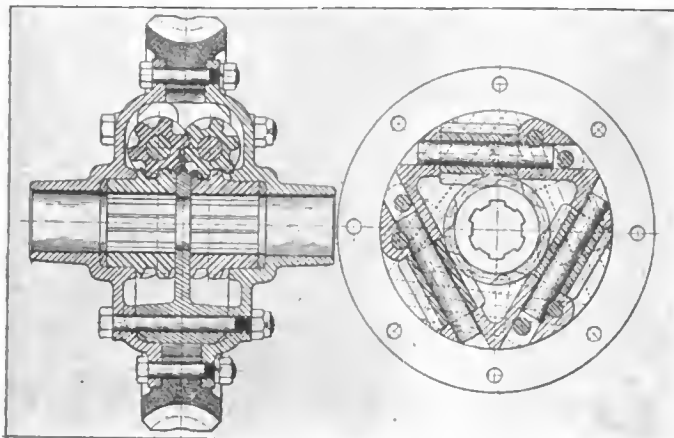
G. Nakamura, son of a wealthy iron and steel manufacturer of Tokio, Japan, who is now in Pittsburg, says he came to this country to buy motor trucks and was going to remain here until he had acquired \$5,000,000 worth. These machines, he says, would be marketed in his own country, Australia and Russia, where there is a big demand for them.

### BIG REDDEN "TRUCK-MAKER" ORDER.

An order for 100 "Truck-Maker" units was recently placed with the Redden Motor Truck Company, New York City, by the Ward Baking Company of New York at the conclusion of a 30-day trial of a single unit that was exhaustively experimented in general service by the baking company.

## WALTER WORM DIFFERENTIAL.

### An Automatic Locking Device That Fully Met Specifications of French Army.



The Walter Automatic Lock Differential: At Left, Cross Section of Gearset Showing Engagement of Worms and Gears; at Right, Triangular Arrangement of Worms.

**T**HE WORM shaft and worm wheel principle are adapted to the construction of the Walter automatic lock differential, patented by Maurice Walter and built by the Walter Motor Truck Company, 49 West 69th street, New York City. This device is designed to avoid unnecessary and objectionable differential action, and to afford the needed compensating and equalizing effects obtained by the conventional spur or bevel gear construction. The gearset does not differentiate because one wheel has greater assistance than another, but only when one wheel must be driven faster than the other that is mounted on the same axle.

The accompanying illustration shows the gearset in sections. The worm gears mesh directly together and separately with the drive shaft worms, a distinctive arrangement that was noticeable in the Walter worm and gear differential first shown two years ago. This is regarded as being the simplest and most direct, and it has minimum backlash. The worm gears are all right hand, the worms having 27 degree lead angle. In the new type of gearset the housing has been much improved, the worm gears being mounted in a centre spider and bolted to the two halves that form the housing and support the ends of the drive shaft worms. The gearset is entirely interchangeable with bevel or spur gear differential gearsets, no change of worm gears, bearings or shafts being necessary.

#### Differential Should Compensate Speeds.

Explanation is made that a differential gearset should, when a turn is made, not merely differentiate, but compensate the speeds of the driving wheels and equalize the torque to the wheels. If, like the ratchet types, it does not compensate, then the average speed of the two wheels is greater on a turn than when driven straightaway, so as to really "gear up" the machine, which is a serious objection on a turn that is steep. Ratchet type differentials only drive the wheel of most resistance, or the inside wheel, and the high friction types, because of the low operating efficiency, concentrate the power on the inside wheel, which tends to turn the vehicle in the opposite direction.

That one may understand why this device has the desired locking action and still differentiates fully, one must know the fundamental characteristics of self-locking worm gearing, on which it is based. Having a worm and gear of say 15 degrees lead angle, the worm may be started easily and will drive the worm gear, but the worm gear cannot start the worm. The greater the resistance the greater is the "static" lock. When the worm is given a start the worm gear will continue to drive it with a high efficiency of about 80 per cent. This action, characteristic of a worm gear driving a worm of less lead angle, is the fundamental principle why the Walter differential has a static lock and a high operating ef-

iciency so as to give equalized as well as compensating differentiation. If a drive wheel leaves the ground or loses its traction, it is not accelerated, because the worm gear cannot start the worm on that drive shaft and the gearset is in a condition of static lock. When turning, however, the initial tendency of the outside wheel to rotate faster releases the static lock and the gearset then drives the outside wheel faster and the inside wheel slower, affording correct differentiation. Were the tires of unequal size the same action would take place.

#### Full Locking Gears Not Necessary.

The use of absolutely self-locking worm gearing is not necessary in actual service, because a driving wheel always meets with some resistance, either from its inertia or its traction, and this resistance will afford the desired locking action with gearing up to about 30 degree lead angle. The gearset can be made with any desired lead angle, but 27 degree has been adopted because it gives the best result in service. With this angle the worm gearing not only has a very smooth and quiet differential action, but in the event of shock the gearing will slip enough to divide the shock load between the two shafts, so that stronger drive shafts are not necessary. Note should be made that if 45 degree gears are used there can be no static lock, as the gears will drive each other equally well. Were more gears added so as to make an indirect train of 45 degree gears, the friction would merely increase and it would have a very low operating efficiency—the gearset would be an internal friction resistance and not a true self-locking device.

Statement is made that about 50 of these differentials are in four-wheel drive tractors that have been used by the French army for about a year, and they have been found to be very satisfactory. Having a turning radius of 12 feet correct differentiation and locking action were very essential. The original French army specifications required locking differentials, but the Walter differential was accepted as meeting these requirements. The construction is under United States patent No. 1,164,770, issued December, 1915, and foreign patents are pending. The statement is made that not only does it not infringe any other patent, but the construction and principle were so distinctive that all claims were allowed without limitation because of any patent.

#### CHASE TRUCK PRICES ADVANCED.

The Chase Motor Truck Company of Syracuse, N. Y., has announced an increase in price of its model "A" one-ton truck and of its model "C" 1½-ton truck. The advance, which will become effective about Dec. 1, is \$75 over the present prices of these models, which after that date will sell at \$1725 and \$2025 respectively.

The price of the model "T" 1500-pound truck remains at \$1500. The prices on the heavier models are: "B," 2½-ton, \$2475; "X," three-ton, \$2800; "O" 3½-ton, \$3300. These prices cover painted chassis equipped with cab and seat.

#### WOULD MOTORIZE FIRE DEPARTMENT.

The city council of Atlanta, Ga., will be asked during the coming year to provide for an expenditure of \$109,150 for motorizing the city's fire department. The city is now placed in the third class, with 1233 points of deficiency charged against it by the National Board of Fire Underwriters. With the motorization of the fire department and eliminating other factors of deficiency, the city will be placed in the second class by the Underwriters' Association and a saving of \$50,000 a year in premiums will accrue to the property owners from lower insurance rates.

#### TRUCKS IN ROCHESTER SHOW.

The automobile show to be held in Rochester, N. Y., by the Rochester Auto Trades Association, will include an exhibition of trucks. The show, which is to be held in Exposition Park in three buildings, will be opened during the week of Jan. 22-27.



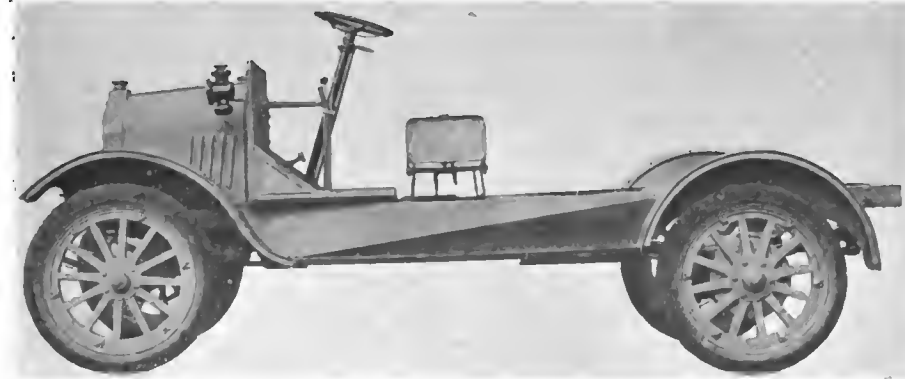
## SELDEN TRUCKS IN FOUR SIZES

*All with Worm, and Two with Internal Gear Power Transmission Systems, Constructed of Highly Specialized Components.*

**F**IVE different size chassis are now sold by the Selden Truck Sales Company, Rochester, N. Y., which are rated at 1500, 2000, 4000 and 7000 pounds respectively, there being two types having 4000

to the endeavors of President George C. Gordon, Vice President William C. Barry, Jr., and Secretary R. H. Salmons.

The Selden company was one of the first to standardize its production, and for a considerable period but one size machine was built, but with increased utilization of power trucks the series was extended until the present range has been reached. Statement should be made that the Selden company has consistently advocated the use of truck chassis with semi-trailer bodies, which doubles the chassis load capacity, so that much larger haulage units are entirely practical with Selden equipment than might be be-



Stripped Model G Selden "Light Delivery" Chassis, Worm Driven, with Semi-Floating Rear Axle.

pounds rating, and directly after the first of the year another will be added to the series, which will have 2000 pounds load capacity, this making really six vehicles in all. Statement is made that these machines will meet the requirements of 85 per cent. of those who engage in highway haulage.

Because of the conviction that a very large number of business men would purchase trucks if they were not required to make full payment upon delivery a plan for marketing trucks was considered. The Selden Truck Sales Company was organized as the selling company, and a system for distribution, with payments extending over a considerable period of time, when desired, was developed. This was the first company in the industry to inaugurate this policy, and experience has proven that it has been thoroughly justified. The methods are practical, have attracted and interested a large number of buyers, and the activities of the company are best demonstrated by the fact that Selden trucks are well known in foreign markets and are sold in practically every commercial centre in the United States.

The plan for operating the company and the manner of exploiting it, so that there would be general knowledge of the deferred payment plan of selling, as well as obtaining recognition of the qualities of Selden trucks, is due

believed from the ratings of the machines. By the use of either truck or semi-trailer bodies the loads that may be carried will vary from 1500 to 14,000 pounds without overloading.

The five chassis built are not to a single standard design, the 1500-pound machine having a semi-floating worm drive rear axle, and one of the two-ton machines having an internal gear rear axle, the other three having full floating worm rear axles. There are some minor differences when the different chassis are compared, but generally speaking there is comparatively little variance and in the main they greatly resemble each other. Claim is made that the quality of Selden machines is very high, that they are extremely enduring and very economical, both with reference to



Model G Selden Chassis Equipped with a Standard Type Express Body and Standing Top.



Model JWL Selden Chassis, Worm Driven, Fitted with a Standard Express Body and a Standing Top.

operation and maintenance. Much care has been taken to obtain simplification and accessibility. The machines are constructed from units that may be regarded as standard designs of the industry, that have been so thoroughly proven by service that practicality and reliability are unquestioned, and their quality is recognized by all who know of motor vehicles.

The general designs of the trucks is stated to be what will meet the approval of buyers who know power vehicles and can discriminate in their choice—who desire what will best serve widely differing purposes—who are not prejudiced and who must select what will afford them absolutely dependable service, no matter what the conditions for use. There is no claim that the machines are cheap in price, but when the main object is to obtain economy of haulage the actual measure is character and length of service.

#### Five Different Engine Sizes.

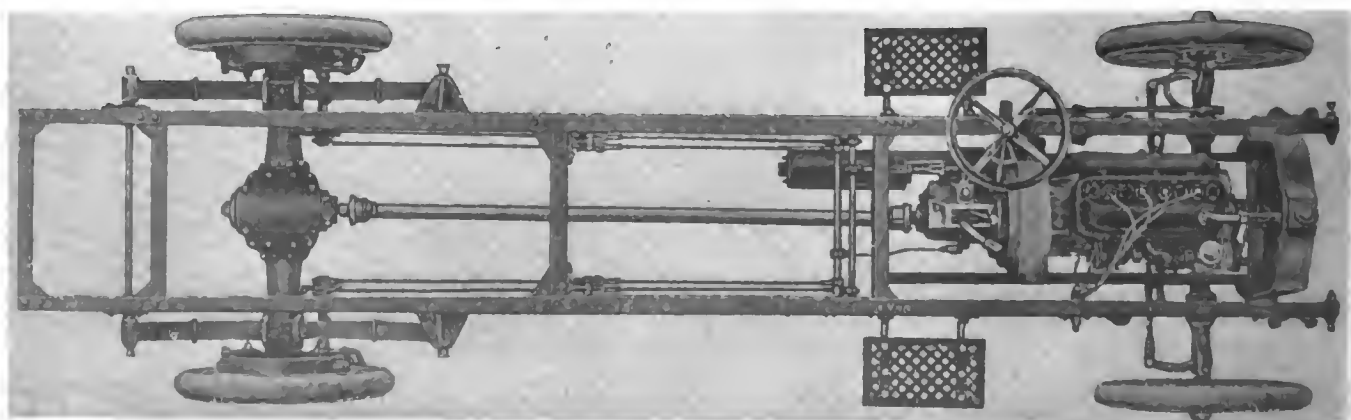
The company uses five different sizes of engines in its trucks, and these are built by the Continental Motors Company, the largest manufacturer of engines in the world. These are all four-cylinder, four-cycle, water cooled, vertical, I. head types and are as follows with reference to cylinder dimensions: Model G chassis,  $3\frac{3}{8}$  inches bore and  $4\frac{1}{2}$  inches stroke, rated at 15.64 horsepower by the S. A. E. formula; model T chassis,  $3\frac{1}{2}$  inches bore and five inches stroke, rated

at 19.61 horsepower; model JC chassis,  $3\frac{3}{4}$  inches bore and  $5\frac{1}{4}$  inches stroke, rated at 22.50 horsepower; model JWL chassis,  $4\frac{1}{8}$  inches bore and  $5\frac{1}{4}$  inches stroke, rated at 27.02 horsepower, and model N chassis,  $4\frac{1}{2}$  inches bore and  $5\frac{1}{2}$  inches stroke, rated at 32.40 horsepower.

Considering these chassis and the engines: Model G has 1500 pounds load capacity and the horsepower claimed is 20; model T is 2000 pounds load capacity and the horsepower claimed is 30; model JC is 4000 pounds load capacity

and the horsepower claimed is 35; model JWL is 4000 pounds load capacity and the horsepower claimed is 40, and model N is 7000 pounds load capacity and the horsepower claimed is 45. The reader will note that these horsepower are not excessive and the ratings are ample for any work for which the machines might be used.

All of these engines are built with the clutches assembled with them as single units, and all of the gearsets save that of model N are a three forward speed ratio selective sliding gear type. The model N gearset is designed for heavy work and has four forward speed ratios. All of the motors save that of the model N chassis are built with the cylinders cast en bloc, the model N engine cylinders being cast in pairs. The engines of the model T and model G chassis are cooled with thermo-syphon circulations of water, and those of models JC, JWL and N are cooled by water circulated by centrifugal pumps. There is some difference in constructional detail between the thermo-syphon and forced circulations of water, the latter having pump shafts as well as camshafts driven by the timing gears and of course an additional gear in the gearsets. With the largest type engine, the cylinders of which are cast in pairs, there are yoke shape water inlet and outlet manifolds. Aside from these details there is comparatively little variance in the engines as a



Plan View of the Model JWL Selden Chassis, Showing the Unit Power Plant and the Long Tubular Shaft, and the Outside Spring Suspension for Hotchkiss Drive.

whole, except as to the size of parts.

#### The Cylinder Blocks and Units.

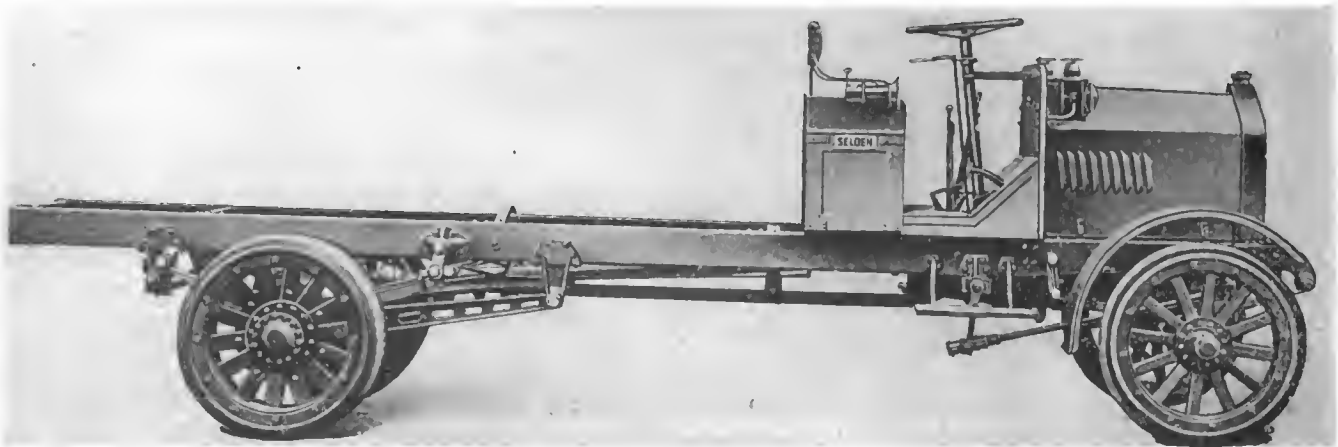
The following description of the engines may be applied generally to all types, aside from express specifications: Both the block and the pair cylinder unit types are cast from a fine quality of gray iron with the water jackets integral, much attention being given to obtaining uniform thickness of walls and freedom of water passages. The block cylinder units are designed to have open water chamber heads, which insures that the jackets will be clear, and these are covered with large plates, secured by series of cap screws that carry single water outlet manifolds. The pair cylinder units are similarly constructed, the water jacket heads being large plates, in the centres of which are the branches of the water outlet manifolds. The units have wide base flange and are webbed under the valve pockets so that the valve operating mechanism may be enclosed by pressed steel plates. The castings are first tested under water pressure and are next rough bored, after which they are aged to insure against machining strain distortion. They are

#### Pistons, Crank and Camshafts.

The pistons are cast from the same material as the cylinders and they are carefully turned and finished to obtain accurate fit. They are channeled for three diagonally split eccentric compression rings that are specially fitted, and there are five grooves below the wristpins to better distribute the lubricant to the cylinder walls. The piston rings are carefully machined to relieve casting strains and are accurately ground on the edges and faces. The holes for the wristpins are bored and reamed with special machine tools to obtain accurate diameter and alignment. All pistons are balanced.

The crankshafts are drop forgings of special alloy steel, each having three journals, with the flywheel flanges and flanges at either side of the main bearings (which take end thrust upon the shaft) forged integral. The shafts are machined and ground and are heat treated to have a tensile strength of 90,000 pounds to the square inch. The bearings and journals and crankpins are large size to insure endurance and efficiency.

The camshafts are two-bearing type for the small-



**Complete Model N Seiden Chassis, 3½-Ton Capacity, Worm Driven. This Being Constructed with Radius Rods to Take the Braking and Torsional Stresses.**

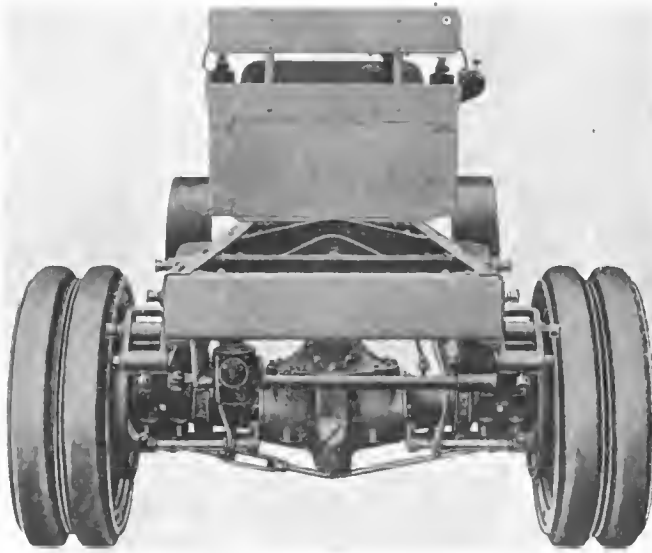
then finish bored and ground and again tested by water pressure. Much care is taken to clear the water jacket passages thoroughly. The water jacket heads are carefully machined and fitted.

The crank cases are all two sections, these having upper sections cast from aluminum alloy that have central transverse vertical webs that carry the main bearings. There are forward extensions that enclose the timing gearset and rear extensions that form the bell housings of the flywheels. The lower sections of the smaller types are pressed steel, but those of the larger are aluminum alloy. These are practically the same in general design, carrying reservoirs for the lubricant and oil troughs into which the big ends of the connecting rods sweep for the distribution by splash. These are retained by bolts and are easily removable for examination of or work on the main and connecting rod bearings. The engines are designed to be mounted on a forward trunnion and on support-arms that are cast integral with the bell housings of the flywheels.

er sizes and three-bearings type for the larger, and are drop forged with the cams integral from special steel. After they have been turned and the cams rough machined and annealed, they are heat treated and finish ground on special machines that perfect the cams. These camshafts are so constructed that they may be withdrawn from the engines after removal of the timing gearset cover plates. The connecting rods are I section steel drop forgings that are heat treated. They are bored and reamed on special machines to obtain correct centres and alignment. The connecting rod caps are secured by nickel steel bolts and nuts that are securely locked.

#### Main Bearings, Wristpins and Valves.

The main bearings are large diameter and unusual length and are nickel babbitt, the linings being held in the bronze shells by brass retaining screws, and the same construction obtains for the connecting rod bearings, which are made adjustable with steel shims. The bearings are designed for truck service and are expected to afford exceptional endurance in heavy



Rear View of Selden Model N Chassis, Showing the Full Floating Timken Axle.

duty. The camshafts of the small types have two bearings and of the large type three bearings, these being of nickel babbitt, being graduated in size from front to rear.

The wristpins are steel tube, hardened and ground to size, that are seated in the piston bosses and retained by locking, and the small ends of the connecting rods are bushed with phosphor bronze and oscillate on the wristpins.

The valves are interchangeable and are made with nickel steel heads electrically welded to carbon steel stems, the ends of the stems being hardened. The valve tappets are a mushroom type, hardened and ground, that are fitted with adjusting screws and nuts. Both the valves stems and the tappets operate in long guides that are renewable when worn. The timing gearset gears are helical cut and have wide faces. They are practically noiseless when in operation. They are housed in a case that may be quickly reached by removing the cover when necessity arises.

#### Cooling and Lubricating Systems.

The two smaller engines are cooled by thermosiphon circulations of water through the water jackets and finned tube radiators, and the water is circulated in the larger engines by centrifugal pumps and finned tube radiators. The cooling systems are ample and the water connections are such as to insure free flowage of water. Radiation is promoted by fans mounted on adjustable brackets on ball bearings, that are driven by flat belts from pulleys on the forward extensions of the camshafts. The lubrication systems are a combination force feed and splash, in the smaller types horizontal pumps and in the larger types vertical pumps, of plunger construction, driven by eccentrics from the camshafts, force oil from the reservoirs through tube to the rear main bearings and the timing gearsets, flooding them, and the overflow fills the oil troughs in the bases of the crank chambers, where it is distributed by splash to the cylinders, pis-

tons, connecting rod, camshaft and wristpin bearings, cams and valve tappets. There are traps in the upper ends of the connecting rods and above the camshaft bearings in which lubricant is collected to supply the wristpins and the camshafts.

The fuel is supplied through automatic float feed carburetors that have hot air jackets coupled to the exhaust pipes, and they are regulated by centrifugal governors that are driven by flexible shafts from the water pump shafts. The governors are set for stated speeds at the factory and are sealed so they cannot be changed without the knowledge of the owners. The ignition current is generated by high-tension magnetos that have fixed sparks. The magnetos are bolted to brackets that are integral with the crank cases and can be quickly and easily removed.

#### Plants Mounted at Three Points.

The power plants are mounted on sub-frames that are supported at three points and cannot be affected by any change in alignment or distortion of the chassis. The clutches and the transmission gearsets are constructed as units and are bolted to the bell housings of the engines. The clutches are a dry plate type, the discs being large in area and faced with anti-friction material, insuring ample capacity and easy engagement. The clutches, being operated without lubrication, require but little attention and materially protect the machines from the carelessness of drivers. The transmission gearsets are a sliding gear selective type, all but model N (which has four forward speed ratios) having three forward speed ratios and reverse. The shafts and gears are of nickel steel, of ample proportions, and the shafts are mounted on roller bearings.

The power is transmitted from the gearsets through large tubular shafts with universal joints at either end. The forward universal joints have broached



Front View of Model N Selden Chassis, Showing the Tubular Type Radiator and I Section Axle.

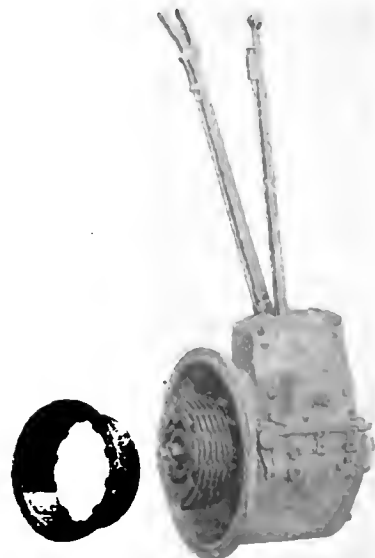
bores into which the shafts telescope and are free to float, while the others are coupled to the rear axles. The joints are large and are enclosed and packed with grease.

### Three Types of Rear Axles.

The rear axles are three different types, that of the model G chassis being semi-floating, that of the model JC an internal gear, and those of the other chassis full floating. The semi-floating axle is a Sheldon construction, that has the David Brown characteristics, with overhead worm shaft and worm wheel, the worm shaft being mounted on annular ball bearings. The axle housing is sectional and the centre section carries the worm shaft, worm wheel and differential gearset that is assembled as a unit on the cover plate, and which may be removed from the axle without disassembling. The differential gearset is carried on annular ball bearings and is not adjustable. The nickel steel driving shafts are mounted in the differential gearset and on annular ball bearings retained in the

outer ends of the housing, and on these shafts the wheels are keyed and retained by locked nuts. The entire mechanism of the axle is operated in a bath of lubricant.

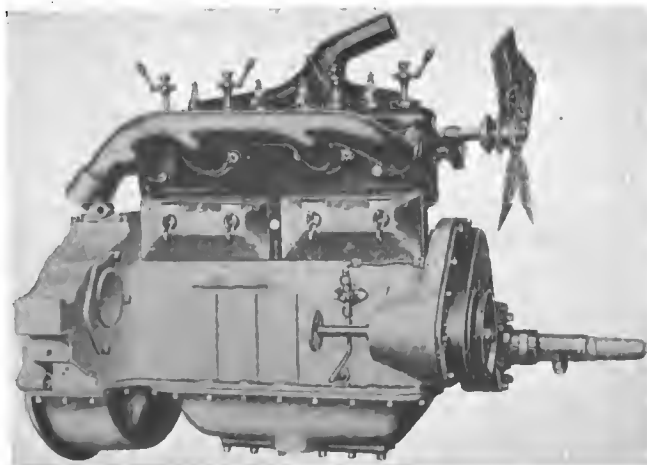
The axle of the model JC chassis is a round drop forging of alloy steel, at the ends of which are the axle spindles. On the axle, inside of the spindles, are the flanges that carry the outer



The Dry Multiple Disc Clutch and Transmission Gearset of the Selden Unit Power Plants.

ends of the jackshaft and, fitted within the brake drums, completely enclose the driving gears. The jackshaft is supported at the centre by a heavy steel bracket fixed on the wheel or dead axle. The pinion shaft, differential gearset and driving shafts, all of nickel steel and of liberal proportions, are enclosed in the jackshaft housing. Spur pinions on the outer ends of the driving shafts mesh with internal ring gears secured to the inner peripheries of the brake drums. The jackshaft pinions and the ring gears are made from special alloy steel, heat treated to obtain long endurance in service. The power is applied at the ring gear, between the hub and the rim, in a manner that parallels the chain and sprockets, but the mechanism is in every way protected and is constantly lubricated.

The rear axles of the other three types are the Timken worm shaft and worm wheel constructions, and are full floating. The axle housings are sectional and

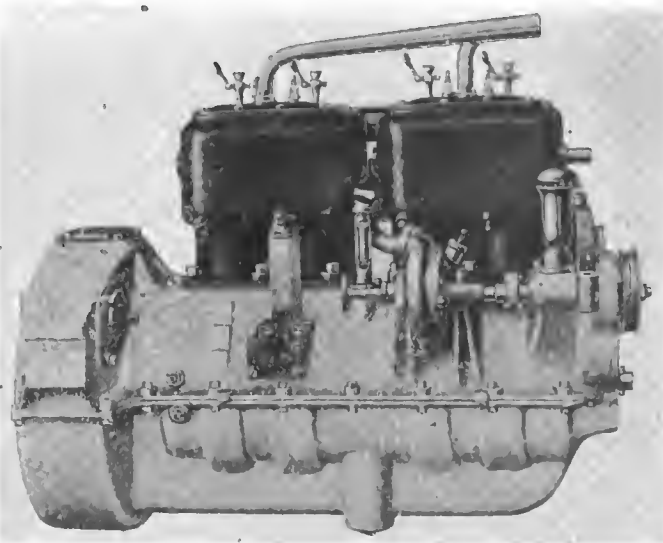


Model N Continental Engine, Cooled by Thermo-Siphon Circulation, Used in the Model G Chassis.

the centre section encloses the worm shaft and worm wheel and differential gearset, which are assembled on the cover plate, which is bolted to the top of the housing. The worm shaft and the differential gearset are mounted on Timken roller bearings, which are adjustable. The driving axle shafts float in the differential gearset and the outer ends engage with the wheel hubs, the wheels being mounted on two Timken bearings, each on the outside of the axle housing. The moving parts of the axle are operated in a bath of oil that affords complete lubrication.

### Frames, Springs, Wheels, Etc.

The frames are pressed steel channel sections, of unusual width and with wide webs that have heavy cross members and are well reinforced by gusset plates. These are suspended on semi-elliptic springs that are exceptionally long and but slightly arched, the rear sets being designed for the Hotchkiss method of drive, in which the springs absorb the driving thrust and driving torque. The spring eyes are bronze bushed and are very large. The springs are a special alloy steel and are triple heat treated. The claim is made that not only does this construction greatly sim-



Model E Continental Engine, Cooled by Pumped Circulation, Used in the Model N Selden Chassis.



plify the machine and minimize the work of lubrication, but there is a distinct increase in tire mileage.

The front axles are I section steel drop forgings, double heat treated, with steering knuckles and spindles of nickel steel. These are all fitted with roller bearings. The wheels are wood, artillery type, with square spokes, those of the model G being equipped with pneumatic tires, 32 by 3½-inch forward and 32 by four-inch rear; model T with 34 by three-inch solid tires forward and 34 by four-inch rear, with option of 34 by three-inch duals; model JWL with 26 by four-inch solid tires forward and 36 by six-inch rear, with option of 36 by three-inch duals; model JC with 36 by four-inch solid tires forward and 36 by six-inch rear, with option of 36 by three-inch duals; model N with 36 by five-inch solid tires forward and 36 by five-inch duals rear. The wheelbase of the model G chassis is 110 inches and the tread 56 inches; the wheelbase of the model T chassis is 126½ inches and the tread 56 inches forward and 58 inches rear; the wheelbase of the model JWL chassis is 150 inches and the tread 56 inches forward and 58 inches rear; the wheelbase of the model JC chassis is 150 inches and the tread 56 inches forward and 58 inches rear; the wheelbase of the model N chassis is 164 inches and the tread 61 inches forward and 65¼ inches rear.

#### Steering Gear and Control Members.

The steering gears are a worm and nut type, designed for truck service that has very substantial linkage, that are located back of the front axle for protection. The location of the steering column is usually at the right side. The control is by the customary foot pedals for clutch and service brake and a hand throttle on the steering column. The gear shifting and the emergency brake levers are in the centres of the floorboards. The service and emergency brakes both operate on the rear wheels, the service brake being a contracting band type and the emergency brake an internal expanding type. The brake bands and shoes are faced with frictional material and are exceptionally large in area, affording positive security.

Much care has been given to obtaining interchangeability of clevis pins and bolts through the chassis so as to have a minimum number of different diameters and lengths, which is a great convenience when making repair or restoration, especially where time is an important factor. The same attention has been paid to lubrication of all moving parts, there being oilers and grease cups installed where wear can be minimized by frequent oiling and greasing. The constructional details have been worked out carefully, the dash being covered with metal to obtain strength, the steering column is strongly braced, the gasoline tank is seamless steel, the lamp brackets are double forked and the fenders are mounted on heavy brackets and are quickly detachable.

The loading space of the model T chassis flareboard express body is 108 inches length and 46 inches width; of model T chassis stake body, 120 inches length and 60 inches width; of model JC chassis flare-

board express body, 120 inches length and 46 inches width; of model JC chassis stake body, 132 inches length and 66 inches width; of model JWL chassis flareboard express body, 120 inches length and 46 inches width; of model JWL chassis stake body, 132 inches length and 66 inches width; of model N chassis flareboard express body, 132 inches length and 54 inches width; of model N chassis stake body, 156 inches length and 66 inches width.

The chassis are sold with driver's seat, fenders, running boards, oil, side and tail lamps, jack, tire tools and tire pump for pneumatic tires, demountable rim for model G, tool kit and horn. The company has in stock standard express and stake bodies that can be supplied when the customers require. Electric starting and lighting systems will be supplied at additional prices. The prices for the chassis are: Model G, \$985; model T, \$1700; model JWL, \$2250; model JC, \$2000; model M, \$2950.

On January 1 this company will bring out a new internal gear model of one-ton capacity—the model to be known as TX, will have 139 inch wheelbase, with a loading space of nine feet six inches from back of the driver's seat. This model will sell at \$1385.

#### ECONOMY OF GOOD ROADS.

A farmer in Franklin county, N. Y., who has a plant for condensing milk at Covington and a creamery at North Bangor, which are 15 miles apart, is thoroughly convinced of the value of good roads as the result of the experience he has had with hauling.

He hauled 25 cans of milk to a load at a cost of 22 cents per ton-mile before this stretch of the road had been improved, and his haulage costs became 12.5 cents per ton-mile after the road had been improved. He bought a motor truck in the spring of 1914 and now hauls 50 cans to the load at a much higher speed, which has reduced his haulage costs to 8.25 cents per ton-mile. This charge includes all the costs and he figures he is saving \$3000 a year as a result of improved roads.

#### MOTOR AND ACCESSORY BANQUET.

The annual banquet of the Motor and Accessory Manufacturers will be held in New York City at the Waldorf-Astoria hotel on the evening of Jan. 10.

William M. Sweet, former secretary of the organization, is chairman of the banquet committee, which is composed of C. E. Thompson, C. W. Stiger, T. W. Wetzell, James H. Foster, Christian Girl and L. M. Bradley.

#### FRONT DRIVE ERICKSON TRUCKS.

The front drive Erickson trucks, designed by C. A. Erickson, formerly chief engineer of the Scripps-Booth Company, will be placed in the market in the near future. They are being made by the Jacobson Machine Manufacturing Company of Warren, Penn.

## GOODYEAR BUSINESS

SHOWS 80 PER CENT. GAIN.

The financial report made at the annual meeting of the Goodyear Tire and Rubber Company of Akron, O., showed that the past year was the most prosperous in the history of the concern. There was increase in the gross business of the company from \$36,000,000 to \$63,000,000, about 80 per cent., and the net earnings of the company increased from \$5,000,000 to \$7,000,000.

President F. A. Seiberling, in his report to stockholders, made the following statement: "It will be of interest to stockholders to know that with 59,000 customers' accounts on the books of the company, the net loss on collections has been less than one-tenth of one per cent. We are pleased to state that prospects for increase in both volume and profits for the coming year are encouraging, and that the policy of the company to manufacture only products of high quality, with fair treatment to its customers, is building a very valuable "good will."

"We have actually had to turn down some orders this year on account of factory capacity. Buildings are now under way that will practically double our factory, and to house workmen this company is back of a plan to build 1000 houses in our part of the city in the near future."

All of the directors were re-elected as follows: F. A. Seiberling, C. W. Seiberling, G. M. Stadelman, F. H. Adams, F. W. Litchfield, H. B. Manton and J. P. Loomis. The old board of officers was also re-elected as follows: F. A. Seiberling, president; C. W. Seiberling, vice president; G. M. Stadelman, vice president and sales manager; P. W. Litchfield, vice president and factory manager; A. F. Osterloh, secretary; F. H. Adams, treasurer; W. E. Palmer, assistant secretary and assistant treasurer; H. J. Blackburn, second assistant treasurer.

## PACKARD EXPANSION.

The Packard Motor Car Company, Detroit, Mich., has purchased a site from the Academy of the Sacred Heart in that city, upon which a new service and sales station will be erected.

This new building will not only provide the company with a modern, centrally located sales and service station, but will release the space now occupied for that purpose, which is needed for increasing the production facilities at the factory.

## SERVICE TRUCK BRANCH.

The New York branch of the Service Motor Truck Company has been moved from 208 West 58th street to the three-story building at 582 West 37th street, where the sales room and service station will be housed under one roof. All of the three floors, having an area of 9240 square feet, will be occupied by the different departments.

## GUARANTY TIME PAYMENT PLAN

## Method by Which Buyers Can, for Small Charges, Obtain Trucks and Use Earnings to Liquidate Investments.

A method known as the Guaranty Time Payment Plan, originated and operated by the Guaranty Securities Corporation, Equitable building, New York City, with offices at San Francisco and Montreal, is such that any responsible concern or individual may buy motor trucks that are delivered immediately and may be paid for as the machines are earning profits for the owners.

Claim is made that when purchases are made by this plan the buyer pays a really negligible amount for the time accommodation and has the advantage of standardized terms, insurance, strict confidence in the transaction, and his local credit is not impaired.

The plan can be briefly stated to be as follows: The buyer makes a choice of a truck, practically all standard makes being recognized under the plan. The dealer is paid 25 per cent. of the delivered price and receives a guaranty contract and a note for the balance, which is payable in equal monthly amounts. The dealer indorses the note and forwards it to the Guaranty Securities Corporation, which collects the monthly remittance from the buyer direct. That the transaction may be maintained secret, the note is deposited in the safety deposit vault of a New York City trust company. It is not seen by others than the dealer and the Guaranty Securities Corporation.

The dealer is paid 25 per cent. of the delivered price. This delivered price includes the cost of the chassis and body, the local freight and the guaranty charges. The guaranty charges are in two classifications. Charge "A" may apply up to \$1500, and it includes incidentals and the usual fire and theft insurance for one year. Charge "B" may be applied to \$1500, but it is required on all trucks selling for more than \$1500, and it includes incidentals and the usual fire, theft and collision insurance for one year. The charges are graduated by truck cost as follows:

Price of Truck	Charge A	Charge B
\$500 or less .....	\$14.50	\$45.00
\$501 to \$750 .....	22.00	52.50
\$751 to \$1000 .....	29.50	60.00
\$1001 to \$1250 .....	37.00	67.50
\$1251 to \$1500 .....	44.50	75.00
\$1501 or more charge B only, five per cent. of delivered price.		

The greater part of the guaranty charge, whether the A or B rate, pays for the insurance, which is necessary for the protection of all interests involved. This insurance becomes effective upon signing the contract and the delivery of the truck. The dealer determines for the corporation whether the collision risk on trucks selling for \$1500 or less is such as to make collision insurance neces-

sary. The following are the amounts involved in a typical transaction by the guaranty plan:

List price truck, f. o. b. factory..\$1200.00  
Freight ..... 44.50

Dealer's delivered price.....\$1244.50  
Guaranty charge (Charge B).... 67.50

Total cost delivered to customer \$1312.00  
Pay dealer 25 per cent. (minimum payment) of \$1312..... 328.00  
Give note for balance in 12 equal monthly payments of \$82 each 984.00

Total paid (excluding interest on deferred payments at or below usual bank rate of six per cent. minimum).....\$1312.00

## 100 PER CENT. DIVIDEND.

In addition to the regular monthly cash dividend of five per cent., the Hoover Steel Ball Company of Ann Arbor, Mich., has declared a stock dividend of 100 per cent.

The present earnings of the company are said to be running at the rate of \$80,000 a month and this figure, there is expectation, will be raised to \$125,000 monthly by February, when the new facilities for increased production are in operation. The company's surplus on Nov. 1 of this year was over \$500,000, and only \$469,000 of the \$1,800,000 authorized capital has been issued. The new stock will be issued to stockholders on Jan. 20.

## MACLEAY IS SALES MANAGER.

The Smith Wheel, Inc., of Syracuse, N. Y., manufacturer of Smith cast steel wheels, has appointed Lachlan MacLeay sales manager of the company.

Mr. MacLeay was formerly secretary of the Syracuse Chamber of Commerce. J. C. Neville, who has been appointed secretary of the company, will also be identified with the sales department.

## NEW CHASE REPRESENTATIVES.

D. F. Shanahan of Covington, Va., has been appointed a special traveling representative of the Chase Motor Truck Company of Syracuse, N. Y.

A. B. MacGowan, formerly in the sales promotion department of the company, is now city sales manager at the Philadelphia branch.

John L. Butler, who for the last year has been in charge of the advertising department of the Pennsylvania Rubber Company at Jeanette, Penn., has been appointed advertising manager.

## TRACTOR INDUSTRY ACTIVITIES

### *Lenox American, Four-Wheel Drive and Steer, for Road or Farm—Army Tests Caterpillar by Cross-Country Trailer Haul.*

**D**RIVEN and steered by all four wheels, with a flexible form of drive that cannot be affected by misalignment, the Lenox American tractor, built by the Lenox Motor Car Company, Hyde Park, a suburb of Boston, is a type that differs very widely from the principles of construction that are generally followed by other manufacturers, although there is no tractor design that can be regarded as conventional.

But being driven and steered by four wheels there is constant traction and the machine has great haulage capacity as compared with other tractors of the same weight and power. The tractor can be used on highways, although not specially designed for this work. It is the creation of R. B. Morton and the first machine was built six years ago, to seven patents for inventions held by Mr. Morton. Mr. Morton was for years connected with one of the largest farm implement manufacturers in the West and the first tractor constructed by him was used wholly for farm purposes.

But tractors of this type have been used for what is distinctly road work, such as "breaking" paths in snow from 12 to 14 inches depth, and at other times work has been done on very soft and muddy highways. In both instances the "cleated-face" wheels were used and highly efficient traction was obtained.

The machines are built in two sizes, the smaller being rated at 20 drawbar horsepower and the larger at 60 drawbar horsepower. The principal difference is in the power plants, for the small tractor has a four-cylinder engine and the larger a six-cylinder engine, the parts of the latter being proportionate to the increase of power. The engines are four-cycle, water cooled, T head types, that are rated at 36.15 and 79.5 horsepower by the S. A. E. formula. The four-cylinder engine has bore of 4¾ inches and stroke of 5½ inches, and the six-cylinder has bore of 5¾ inches and stroke of seven inches. These engines are designed for what is expressed as semi-heavy duty and are driven at comparatively slow speeds. While other fuel may be used the use of gasoline is recommended.

The engines are built with very large crankshafts and exceptionally large valves and the bearings are of very liberal proportions. Every provision is made for enduring wear. The lubrication is by a force feed system that circulates oil to all the bearings and the cylinders. The cooling systems are positive, the water being circulated by centrifugal pumps. The outlet and inlet manifolds are unusually large. The cooling is promoted by large fans that are driven by gears and clutches are provided to relieve the fan shafts of all



**Lenox American Four Wheel Drive and Steer Tractor with Cab and Hood Removed to Show the General Constructional Details.**

strains from starting. The tubular radiator is in two sections with adequate air spaces. The engine starting crank is geared with a 2:1 reduction so that starting is comparatively easy. The engine is mounted on the chassis side members by four steel brackets.

The fuel is supplied through Carter carburetors and the engines are equipped with automatic governors, and with automatic speed control operated in unison with the clutch. Two sets of spark plugs are fitted and there is a battery and coil and distributor for starting and a high-tension magneto with fixed spark for service. Thus there are two separate systems of ignition.

The frame is constructed of two steel channels of heavy section, hot riveted, with four cross members, that form a positively rigid unit. The flywheel is unusually large and the clutch is an expanding shoe type that is operated through a rack and pinion by hand, there being no springs, the action being positive. The transmission gearset is enclosed in a large case that is suspended from the frame directly back of the engine. It is a selective three forward speed ratio and reverse type. All shafts and gears are nickel steel and the gears are specially hardened. The shaft bearings are the best grade of babbit metal, and there are three bearings for each shaft. All the gears are large and have wide faces. The gear shifting mechanism is entirely enclosed in the oil tight case.

The brake drum is mounted on an extension of the gearset secondary shaft

outside the gearset case, and the brake is operated by the same lever that actuates the clutch, the linkage being so designed that the release of the clutch applies the brake, and releasing the brake engages the clutch. The brake is a contracting band type operating on a large drum. The driving shaft is carried on roller bearings in brackets bolted to the lower side of the chassis frame, and on this shaft are the steel drive gear and the chain sheave, the whole being enclosed in a steel case.

The drive to the front and rear axles is by adjustable chains made of the highest grade of vanadium steel forgings. A feature of this drive is that the working surface is between the outside of the chain link and the pocket in the sheave wheel, and the axles can be turned for steering without loss of power. Each chain link is adjustable for stretch and wear, and is self-locking, the construction being such that there is several times the wearing surface that would obtain with the use of sprocket wheels.

The axles, which are semi-floating, are identical, differing only in the manner of attaching them to the frame. The axle shafts are nickel steel carried in roller bearings of large size, there being four bearings for each axle. The differential gearset used in automobile construction is replaced by the chain sheave that carries the differential pinions. The rear axle is mounted in a large ball bearing secured to the frame, the relation of the axle and frame being always maintained and the front axle is mounted on a ball and socket joint.

The steering gear is a worm and worm wheel type, completely enclosed in the housing, connection to the axles being made through block chains and turn-buckles. The gear is operated by a large hand wheel located in the centre of the cab, so that the control levers may be conveniently reached by the driver. The wheels are made of iron angles, spokes and steel cleats, the rims being formed by three rim rings carrying cross cleats placed at an angle of 22 degrees, the cleats being steel drop forgings. Each wheel has 30 spokes and eight pull rods, all of which are in straight tension and sustain the driving thrust, the spokes carrying the radial load only. There are spaces between the cleats that obviate clogging by mud or snow.

The hood and cab are sheet metal, secured to the rigid angles of the frame. Hinged doors in the hood afford easy access to the engine. Leather curtains for the windows of the cab protect the driver in the event of cold or stormy weather. The drawbar may be changed from the rear to the front of the chassis as work may necessitate, and there is a special drawbar for use when plowing. The wheels of the small tractor are 40 inches diameter and 10 inches width, and those of the large machine are 60 inches diameter and 18 inches width.

In driving the tractors the axles are turned, not the wheels, this avoiding the use of universal joints, steering knuckles and special linkage and the attendant complications. Extremely short turns can be made, in and out of gutters and ditches and furrows, and side hill plowing or haulage can be done. Operating the tractor, two levers are used, one of which is for shifting gears, and the other engages the clutch and releases the brake or engages the brake and releases the clutch, opening or closing the throttle as the clutch is engaged or released. This interlocking increases the speed of the engine whenever there is work to be done to the point where it is adequate for the load, and the governor prevents racing.

The speed of the small tractor is 1½ miles an hour on low gear ratio, to 2½ miles on second and to six miles on third or high, the minimum speed being ¼ mile; the speed of the large tractor is to 1½ miles an hour on low gear ratio, to 2½ on second and to five miles on third, the minimum speed being ¼ miles. The small machine will develop nominally 3000 pounds drawbar pull and will haul four plows with drag and harrow, and the large tractor will develop nominally 8000 pounds drawbar pull, and will haul 10 plows with drag and harrow. Statement is made that the front wheels can be driven over obstacles 30 inches high without straining the tractor or overcoming the centre of gravity of it. The rear wheels are not as flexible as the forward set but will follow the front wheels over such obstructions, although the body of the tractor would be tilted at an angle.

The haulage possibilities of the tractor are very large. One of the accompanying illustrations show a tractor in a shop, this being used to give an idea of

the general construction, and the other shows a tractor hauling a hydraulic press weighing 28 tons through heavy snow, where the traction would not be good.

#### BIG TRACTOR COMPANY FORMED AT INDIANAPOLIS.

Carl G. Fisher, James A. Allison, Henry F. Campbell, Quincy A. Myers and Edward E. Gates are the incorporators of the Highway Tractor Company, which has been organized at Indianapolis, Ind., for the manufacture of highway tractors. The plan for the organization comprehended the choice of Charles G. McCutchen, Detroit, Mich., as president; Carl G. Fisher, vice president, and James A. Allison, secretary and treasurer, but the election will not take place until after the first of the year.

The company has a site of 25 acres near the Speedway City, just outside of Indianapolis, and the construction of a two-story brick office building, and a steel reinforced concrete structure approximately 200 by 400 feet, which will be used for manufacturing, has already been begun. Already considerable progress has been made on the buildings. The originators of the company are Mr. McCutchen and B. R. Parrott of Jackson, Mich., a mechanical engineer, who has designed and constructed a highway tractor, and the machines that will be produced are designed by Mr. Parrott.

The company expects to have material and its factory equipment installed so that manufacturing can be begun by May 1, and the manufacturing plan is to construct 5000 tractors the first year. One size only, which will weigh 10 tons, will be built at first, but other sizes will be designed and constructed as the possibilities and the needs are developed. The price of the initial machine will be, so statement is made, approximately \$1250. There is probability that farm tractors will be designed and built.

The company is capitalized at \$2,000,000 and the first unit of the plant will cost approximately \$200,000. Mr. McCutchen was formerly general manager of the Premier Motor Corporation of Indianapolis, Ind., and later president of

the Ross Motor Car Company of Detroit. He financed the experimental work that developed the tractor that will be built. The factory manager will be A. E. Schaaf, formerly manager of the Pope Manufacturing Company's Toledo, O., plant, and until recently with the F. I. A. T. Automobile Company at Poughkeepsie, N. Y. Among the stockholders of the company are Louis Goodhart of St. Louis, Mo., Dr. M. N. Stewart and F. C. Badgley of Jackson, Mich. Statement is made that demonstrations of the first tractors have attracted the attention of the United States War Department.

#### TRACTOR DEMONSTRATION.

In connection with the live stock meeting at the University of Florida, Gainesville, Florida, Jan. 16-19 inclusive, there will be demonstrations of farm tractors made by a number of manufacturers. So great is the interest of Florida farmers in power farming tools that request was made the organizers of the meeting to invite builders of machines to show them at work. The trials are expected to attract a large number from Florida and the adjacent states.

#### BEAN TRACK PULL TRACTOR.

The Bean Spray Pump Company, San Jose, Cal., one of the largest manufacturers of spraying apparatus in the world, has begun the manufacture of the Bean Track Pull Tractor, a machine that differs radically from conventional types in that it is claimed to operate as a horse pulls a tool, making remarkably short turns. The company has an eastern factory at Lansing, Mich., which will begin production about May 1, 1917.

#### TRACTOR ROAD BUILDING.

Jackson County, Arkansas, has purchased three large tractors for use in road construction and maintenance, and is now using the machines for all manner of material haulage and for such other work as is necessary. These have replaced the animals and are used with trailers.



Lenox American Tractor Hauling a Trailer Loaded with a Hydraulic Press Weighing 28 Tons Through Deep Snow.



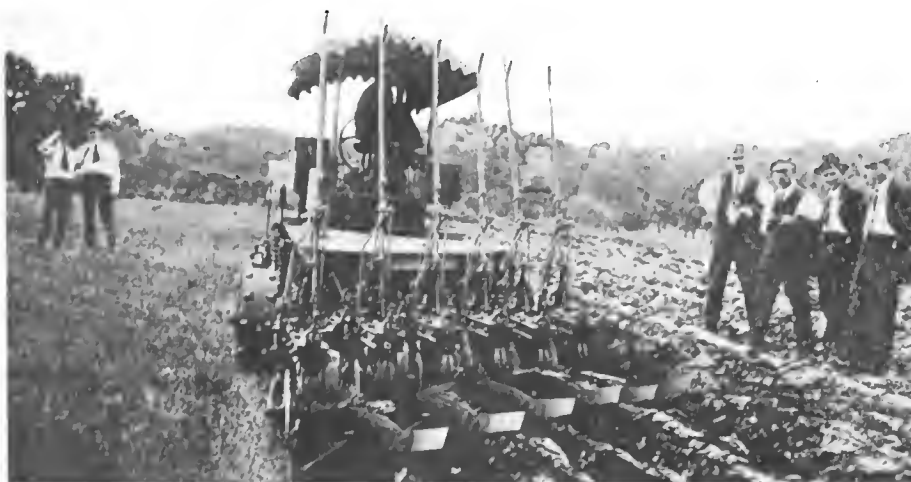
### ARMY TESTS TRACTOR IN CROSS-COUNTRY MARCH.

A test of Holt tractors, which are a tracklaying type and are known by the trade name of "Caterpillar," is now being made by the quartermaster-general's department of the United States army in Texas. The operations of the army now guarding the border are directed by Major-General Funston, whose headquarters is at San Antonio, Tex. One of the points from which troops operate is Marfa, which is in the western part of the state, on the main line of the railroad that in a general sense parallels the border. The Rio Grande river in its generally southeast course to the Gulf of Mexico makes a sweeping circle northerly, and this section of the border is known as the "Big Bend" district.

From Marfa to Presidio or El Oro on the Rio Grande river is a railroad branch, and Presidio is a place of considerable importance. The country is very rough and is practically without roads. It may be traversed best by animals. At Marfa were three tractors of the same type of 18, 75 and 120 horsepower respectively. The 75 horsepower machine was sent across country to Presidio hauling four trailers of 15 tons capacity each, the four being loaded with 75,000 pounds of lumber. The test was directed by Captain Harry A. Hegeman, who accompanied the train to observe conditions. The distance, 63 miles, was traversed at an average speed of approximately two miles an hour, and according to statements made by Captain Hegeman he found the machine and the trailer equipment practical. The trailers, however, were of greater capacity than would ordinarily be used. The tractor can be used to better advantage on soft or sandy surfaces than on rough or badly rutted roads—a conclusion that was inevitable. A retail report will be made covering the test and there is probability other trials will be made.

### TRACTOR CLUB OFFICERS.

The Tractor Club of Kansas City at a



Strait Tractor, Rated at 50 Horsepower, Hauling Six-Furrow Plow with 14-inch Moldboards, in Heavy Sod at Depth of Seven to Eight Inches—This Machine Weighs 10,000 Pounds and is a Track-Laying Type.

meeting in the Hotel Muehlebach, on Dec. 5, elected the following officers: E. J. Anderson, president; H. L. Thiema, vice president; Guy Hall, secretary and treasurer, and W. R. Ellis, H. A. Kaufmann, G. C. Weyland and L. J. Brooking, directors.

Plans for the tractor show, which will be held during the week of the automobile show, have been completed and this year's exhibition will be much larger and more comprehensive than the last show.

### STATE SHOWING TRACTORS.

The office of farm demonstration of New Jersey has sought to benefit the farmers by assisting in the demonstration of farm tractors in different sections of the state, and these have been made on the farms of interested owners where the conditions have been sufficiently diversified to show the work that can be accomplished with machines. These trials have been well attended and more of them are in prospect.

### TRACTORS BOUGHT BY CUBAN SUGAR PLANTERS.

The McIntyre Manufacturing Company, Columbus, O., has shipped to the S. L. B. Agricutural Company a large farm implement dealer of Havana, Cuba, the first of a series of machines that have been bought for distribution to sugar planters, and another series of machines has been ordered which will be shipped to England. The McIntyre company manufactures a tractor that is known as the "Farmer Boy" and which is designed to do what may be regarded as general light farm work. The tractors shipped to Cuba will be equipped with canopies to protect the drivers from the heat, but the other machines sent abroad will not have this equipment.

### STEAM FARM TRACTORS NOT RECENT CONCEPTION.

The J. W. Fawk steam tractor for plowing and other farm work was, according to records in the United States

patent office at Washington, patented Dec. 13, 1859, and this machine was designed to operate eight 14-inch plows. When tests were made the tractor plowed 4.3 acres an hour "perfectly satisfactory to the committee and spectators," and the depth of the furrows could be regulated at will. Prior to this gang plows were operated by two engines located on opposite sides of a field, the width depending upon the cable, and steam cultivation had been extensively experimented with in Wisconsin, Louisiana and in England.

### LAYS MAINS WITH TRACTOR.

The Hartford City Gas Company, Hartford, Conn., lays its gas mains with a Buckeye traction ditcher, a trench digging machine that can dig about 700 feet of trench 24 inches wide and six feet deep in a working day, which is equal to the work of 30 laborers. It is operated by one man.

### NATIONAL TRACTORS TO BE BUILT AT WICHITA.

The National Tractor Company has been organized at Wichita, Kan. with capital of \$250,000 and a warehouse building has been leased for temporary use pending the erection of a factory. The officers of the company are: J. B. Johnson, president, for 15 years general manager of the La Crosse Plow Company, La Crosse, Wis.; Wallace T. Rouse, Wichita, vice president; A. L. Palmer, Jr., Kansas City, secretary, and J. C. Conley, Wichita, treasurer. The company has purchased plans and patterns from the Agrimotor Engineering Company, La Crosse, Wis., for a tractor for general farming purposes, designed by A. W. Melcher, designer of the Waterloo Boy tractor. The machine will be known as the National and will weigh 3270 pounds. It will be a four-wheel automobile drive type and it will be sold for from \$675 to \$700. Manufacturing will be begun as soon as the equipment for the temporary factory can be obtained, and the purpose is to increase the production as rapidly as the demand will justify. A tractor built to the plans bought by the company was given very complete tests in all manner of work and in the presence of a considerable number of implement dealers before the machine was accepted as satisfactory.

### EDUCATING THE FARMERS.

In the farming sections of the country where there is no fall of snow during the winter and the ground is not frozen tractor demonstrations are frequently made by the agents of manufacturers or sales representatives, which events are widely advertised and interest stimulated by well prepared publicity. The results of these trials, which are intended to be as nearly practicable what may be termed normal conditions, have been very satisfactory.





Lynn B. Dudley, Advertising Manager,  
Federal Motor Truck Company.

#### DUDLEY WILL DIRECT FEDERAL ADVERTISING.

The advertising department of the Federal Motor Truck Company, Detroit, Mich., is now directed by Lynn B. Dudley, who retired from a three-year association with the Campbell-Ewald Company, advertising agent, with offices in Detroit, to assume that position. He succeeds George W. Cushing, who resigned from the Federal company to join the advertising department of the Hudson Motor Car Company.

Mr. Dudley has had something like 12 years editorial and advertising experience with newspapers, and during a part of his connection with the Campbell-Ewald Company had supervision of the publicity of the Federal company, so that he is well informed of Federal policies and the plans now made for development.

The plans for the Federal company for the coming years are well developed and comprehend material expansion. There will be at least one new building erected, that will be for the use of the assembling department, and there is probability of other additions. In the year just closing new structures were built to increase the production of the factory. The added facilities will not be adequate to meet the demand for Federal trucks and because of the fact that two new sizes of Federal machines will be produced the output will be considerably larger in number than what was originally planned for 1917. These trucks will shortly be announced.

Statement is made that of all orders received for machines by the Federal company more than 62 per cent. are "repeat," which is regarded as a convincing evidence of the satisfaction obtained by owners. Deliveries have been delayed somewhat by shortage of cars, and trucks have been delivered direct from the factory by drivers within a radius of several hundred miles.



T. P. Myers, Truck Department, General Engineering Company, Detroit.

#### MYERS WILL DEVELOP THE DOBLE STEAM TRUCK.

T. P. Myers, who was manager of the truck department of the Packard Motor Car Company of New York, New York City, has become associated with the General Engineering Company, Detroit, Mich., and will devote himself to development of the Doble steam truck. Mr. Myers has been for a number of years identified with the motor vehicle industry, being sales manager of the Rapid Motor Truck Company of Pontiac, Mich., and later connected with the Willys-Overland branch at Philadelphia and still later with the Packard company.

Mr. Myers, with long experience with trucks, is convinced that there are very large possibilities for economies with machines built to the Doble inventions and maintains that the exceedingly simple construction and the low cost of operation should be very cogent factors for reducing the cost of dealer service.

#### DENNEEN DEMONSTRATION.

S. R. Scott, district sales manager of the Denneen Motor Company of Cleveland, O., with his assistant, J. W. Pendergast, is making a tour of Indiana, Iowa, Michigan, Minnesota, North Dakota, Oklahoma, New Mexico and Nebraska. They will require many months for the journey as they are driving one of the Denneen trucks en route, giving practical demonstrations in the principal cities and towns.

#### HASSLER MOTOR COMPANY.

Robert H. Hassler, Edward D. Fouts and David G. Ong are the directors of the Hassler Motor Company of Indianapolis, Ind., which was recently incorporated with a capital of \$200,000. The company will engage in the manufacture of automobiles and motor trucks.



Herbert J. Flint, Sales Manager, J. C. Wilson Company, Detroit.

#### HERBERT J. FLINT IS THE WILSON SALES MANAGER.

Herbert J. Flint, general manager of the J. C. Wilson Company, Detroit, Mich., is developing a sales organization for that concern that is country-wide and has in a comparatively short time established Wilson trucks as standard vehicles in the industry and with those who utilize machines for haulage. Mr. Flint began his motor vehicle experience in Denver, Col., where in 1908 he sold Oldsmobiles, and then he went to Detroit, where he was made branch manager for the Olds Motor Works. He was appointed special representative, assisting W. J. Mead, and traveled the country in this work. He resigned to become manager of the Hupmobile Sales Company of Detroit, which association continued for two years.

He retired to join Thomas J. Hay of Chicago, distributor of Hupp and Chandler cars, and was manager when a year ago he became identified with the Smith Form-A-Truck Company, being in charge of the eastern territory, with offices in New York City. He is credited with marketing 10,000 Smith machines in six months. He joined the Wilson company July 1 and has developed a very effective dealers' organization, especially in New York, New Jersey and Michigan. His sales department has been extremely aggressive and the name of the Wilson truck is very generally known. In connection with its other activities the sales department operates what Mr. Flint refers to as his "transportation bureau," which studies the needs of prospective truck buyers and prepares careful reports on the character of equipment and the methods of operating that will produce economies.

The Maxfer Auto Truck Sales Company of Dayton, O., has been incorporated in that state with a capital of \$10,000 to operate storage rooms, repair and paint shop. George H. Connolly and others are named as the incorporators.



A. A. Gloetzner, Sales Manager and Chief Engineer, Covert Gear Company.

#### CLUM BECOMES HEAD OF COVERT GEAR COMPANY.

Jan. 1 B. V. Covert, founder and president of the Covert Gear Company, Inc., Lockport, N. Y., maker of transmission gearsets, will retire from active control of the company and will be succeeded by P. A. Clum, its treasurer, who has had executive control since the inception of the business, and who will serve as president as well as treasurer. Mr. Clum has purchased practically all of the common stock held by Mr. Covert, but the latter will retain a substantial financial interest in the concern.

Mr. Clum has appointed F. E. Mosher general manager. Mr. Mosher has had more than 20 years experience as accountant and executive, having been auditor of the Eastman Kodak Company and the American Seeding Company for nine and five years respectively, public accountant and auditor for three years and treasurer of the Sill Stove Works, Rochester, N. Y., for five years, resigning from the last named concern to join the Covert company.

A. A. Gloetzner has been named chief engineer and sales manager, the sales management having been resigned by Gould Allen, located at Detroit. After being graduated by the University of Columbia Mr. Gloetzner was with the Westinghouse Electric and Manufacturing

Company for two years, and was successively purchasing agent and assistant general manager of the Olds Motor Works, purchasing agent and assistant general manager of the Owen Motor Car Company, factory manager of the Krit Motor Car Company, assistant chief engineer of the Chalmers Motor Company and vice president of the Bour-Davis Motor Car Company of Detroit, resigning this connection to join the Covert company. Mr. Gloetzner will serve all engineering inquirers from his office at the Ford building, Detroit.

The Covert Gear Company, which was organized with small capital a few years since, has developed very rapidly, and was recently reincorporated for \$1,000,000. The production planned for the coming year is much larger than for any previous year.

#### GRAMM-BERNSTEIN ISSUES NEW CATALOGUE.

The Gramm-Bernstein Motor Truck Company, Lima, O., builder of Gramm-Bernstein trucks, has issued a new catalogue that is particularly interesting. The book, which has 32 pages and cover, is devoted to general description, illustration and specification of the seven different sizes of machines produced by the company. The print is handsomely designed and contains a considerable number of illustrations of uses made of Gramm-Bernstein machines in all parts of the world. The mechanical detail is creditably prepared and arranged and unusually well presented pictorially and in text.

#### TIMKEN ADVERTISING.

W. H. Taylor, formerly with the Campbell-Ewald Advertising Agency of Detroit, has been appointed advertising manager of the Timken Roller Bearing Company, with headquarters at Canton, O. The advertising of this branch of the Timken industry will be managed separately from that of the Timken-Detroit Axle Company, which remains in the hands of Frank N. Sim, who has headquarters at Detroit.

#### MANLY MOTOR TRUCK COMPANY.

The Manly Motor Truck Company has purchased a factory in Waukegan, Ill., where the company will move its manufacturing operations this month.

#### ACTIVITIES OF MOTOR PRODUCTS CORPORATION.

The Motor Products Corporation, which is now operating the plant the Lozier Motor Company established at Detroit, Mich., is successor to the Diamond Manufacturing Company of Detroit and Walkerville, Ont., Rands Manufacturing Company, Vanguard Manufacturing Company and Universal Metal Company, all of Detroit, and the Superior Manufacturing Company of Ann Arbor, Mich. The company is not a holding company, but is operating all of the businesses of the companies it has succeeded under one management. The purpose is to remove the Detroit factories to the Lozier plant and to operate them as a unit.

The management of the Motor Products Corporation is entirely in the hands of the men who developed the business of each of the old companies, who are W. C. Rands, president, of the Rands Manufacturing Company; C. F. Jensen, vice president and purchasing agent, of the Vanguard Manufacturing Company; D. B. Lee, treasurer and general manager, of the Diamond Manufacturing Company; H. H. Seeley, vice president and sales manager, of the Superior Manufacturing Company; M. L. Brown, secretary, of the Universal Metal Company, and R. R. Seeley, production manager, of the Superior Manufacturing Company.

The company is producing metal specialties, which include hub caps, radiator parts, tubing and metal shapes, exhaust tubes, muffler cut-out pipes, molding for automobile bodies, windshields, clutch cones, curtain carriers and other similar fittings and equipment used in motor vehicle construction. The Lozier plant was acquired at a cost said to be close to \$1,000,000. It is sufficiently large to insure for future expansion. The abandoned factories in Detroit will be disposed of.

#### AUTOCAR OFFICERS ELECTED.

The following have been elected officers of the Autocar Company of Ardmore, Penn.: D. S. Ludlum, president; L. S. Clarke, W. W. Norton and E. A. Fitts, vice presidents; F. C. Lewin, secretary and treasurer, and J. C. Taney assistant secretary and treasurer. Mr. Fitts was formerly secretary and treasurer of the company and Mr. Lewin was his assistant.



Officers of the Motor Products Company, Detroit, Mich., from left to right: W. C. Rands, President; C. F. Jensen, Vice President and Director of Purchasing; H. H. Seeley, Vice President and Director of Sales; D. B. Lee, Treasurer and General Manager; M. L. Brown, Secretary; R. R. Seeley, Production Manager.



George H. Boggs at Left and Lawrence K. Earle at Right of Earle & Boggs, Eastern Sales Agent of the Buda Company.

#### EASTERN SALES AGENT OF THE BUDA COMPANY.

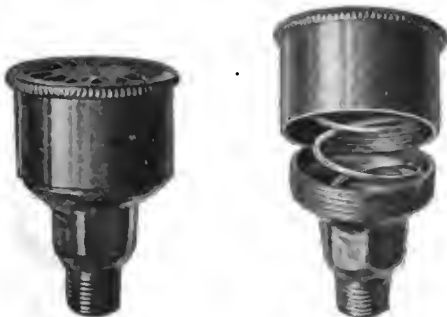
The firm of Earle & Boggs, composed of Lawrence K. Earle and George H. Boggs, manufacturers' representatives, at 1790 Broadway, New York City, has been made the general eastern sales agent of the Buda Company, Harvey, Ill., manufacturer of Buda engines, and will in future distribute the products of this concern in the eastern section of the country.

The Buda Company is widely known as the builder of a series of engines of high quality designed for automobile vehicles of all kinds and tractors, which are very generally used by manufacturers of pleasure cars, trucks and power farm tools, and the appointment is made with a view of further developing its selling organization.

The Buda Company has within a comparatively short time largely increased its manufacturing facilities and is now prepared to make prompt deliveries of its products and has planned its output on a scale that is believed will be adequate for all demands that will be made upon it by the industry.

#### THE "M. & E." GREASE CUP.

A standard product that is widely used is the "M. & E." grease cup, produced by the Merchant & Evans Company, Philadelphia, which is claimed to be short, simple, clean and very efficient. This grease cup has a ratchet top, having an internal coil spring that engages in radial corrugations of the top or cap. The company, which is patentee and manufacturer, is



The "M. & E. Grease Cup," Assembled and with the Cover Removed.

now prepared to furnish car and truck manufacturers with a better made grease cup, it having a more pleasing design, slightly greater capacity, better threads, longer and stronger shank and much superior finish.

Statement is made that the special finish is extremely resistive to rust, it being a close approach to nickel plating in brightness and lustre, with no coat to peel. This lustre can be retained by occasional rubbing with an oily cloth. There being no additional charge for this finish the

cup is interesting those who formerly used nickel plated and polished cups. The Merchant & Evans Company is now completing its 30th year of business and is well known in the motor vehicle industry as manufacturer of Hele-Shaw clutches, Evans alignment joints and Evans universal joints.

#### GASOLINE TRUCK TRACTOR.

The Milwaukee Locomotive Manufacturing Company, Milwaukee, Wis., is manufacturing a new gasoline truck tractor having load capacity of 4000 pounds and designed to haul a trailer loaded with 7000 pounds additional.

It is equipped with a four-cylinder engine with a bore of  $3\frac{3}{4}$  inches and  $4\frac{1}{4}$  inches stroke. While it is operated as is a motor truck for highway haulage, it is designed for use at freight terminals for moving heavy merchandise about.

#### KELLY-SPRINGFIELD PLANT.

Plans for the new plant of the Kelly-Springfield Tire Company of Cumberland, Md., are being prepared and the builders expect to break ground early in the spring. When housed in the new factory the productive capacity of the Kelly-Springfield Company will be increased 400 per cent.

#### PRECISION DIE CASTING COMPANY.

The entire business of the Van Wagner Die Casting Corporation, formerly the E. B. Van Wagner Manufacturing Company, and the Precision Die Casting Company, has been purchased from Charles Van Wagner and the two companies will be merged into the Precision Die Casting Company, Inc., of Syracuse, N. Y.

Alterations and extensions will be made in the equipment and plants to improve the quality and to give better service and ample capital is provided to take care of a large increase in business. The men who control and manage the business are well known to the industrial and financial world and the automobile trade.

The officers of the company are: T. G.

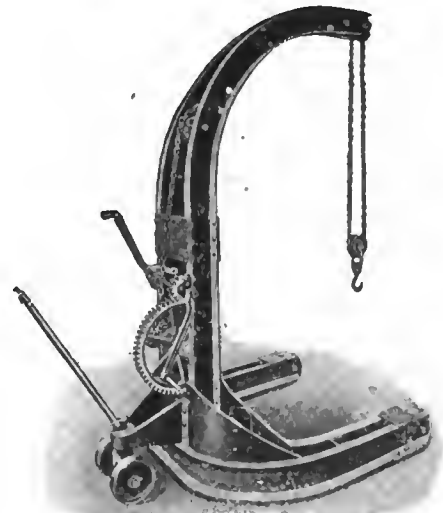
Meachem, vice president and general manager of the New Process Gear Corporation, president; J. W. Knapp, treasurer Van Wagner Die Casting Corporation, vice president; H. S. Tenney, secretary, Syracuse Trust Company, treasurer; E. J. Quintal, secretary. The officers and the following comprise the directorate: A. P. Bellinger of the Solvay Process Company, G. W. Bowen of the Bowen Manufacturing Company, Auburn, N. Y., and W. A. Ball of the Semet Solvay Company.

#### LAFAYETTE STEEL CRANES.

The Lafayette Engineering Company, Lafayette, Ind., is producing the Lafayette portable steel crane, adapted for service in factories, garages, machine shops, service stations and tire factories and shops. It is a complete hoisting and conveying machine. The cranes are built in three sizes, having lifting capacities of 3000, 4000 and 5000 pounds, and consist primarily of a jib mounted on a horseshoe base, the jibs having overhang of 30, 36 and 42 inches respectively.

The bases are mounted on double wheel casters and wheels at the ends, and on these the curved jibs are built. All structural parts are steel and cannot break, the parts are assembled with bridge rivets and there is a hand winch with the power so compounded that the load capacity of the crane can be lifted very readily.

There are two locks for the winch, so that it is absolutely safe for any work. The base of the crane is low enough to clear any vehicle axle. There is a hand lever attached to the caster, with which the crane can be readily moved and placed exactly wherever wanted by a boy. The crane is designed to lift the ends of the heaviest cars for work beneath them, removing or putting on tires, taking out or installing engines, or any similar work for which jacks and plts are now used. The wheels of the crane are mounted on roller bearings. The hoisting chains are guaranteed not to break with three-ton loads.



The Lafayette Steel Crane, Designed for Garages, Service Stations and Repair Shops.

### TUNNEL FOR VEHICLE TRAFFIC UNDER HUDSON.

The New Jersey Interstate Bridge and Tunnel Commission has been granted a permit by the War Department to build a tube under the Hudson river for vehicle traffic between Jersey City and New York.

It is understood that the tube will be run from the foot of Canal street in New York to Thirteenth street, Jersey City. Plans showing the definite location of the tube have not been filed, but the permit requires that the tunnel shall be located at least 50 feet below mean water. It is estimated that the cost of the tunnel would be \$11,000,000, of which amount New York state would bear one-half. It would be built in two sections, the same as the railroad tubes that now pass under the river from New York to New Jersey.

The Boards of Freeholders of Bergen and Hudson counties, New Jersey, have already approved the plan for the tube and the Essex County Board stood four to four on the question last summer, but will vote on it next month. Action of the three counties is necessary before the governor can appoint a commission with full powers to carry out the work.

### DICKINSON JOINS CHAMPION.

Don M. Dickinson, well known in automobile circles in New England, where he was connected with a number of agencies, has been appointed director of sales of the Champion Motors Company, Inc., Hippodrome building, Cleveland, O.

He was interested in the manufacture of the Woodworth truck that was made in Providence, R. I., and was at one time identified with the Federal and Kissel truck agencies in that city. He organized a company to operate a line of automobile buses in Providence, which is said to be the first jitney enterprise in the country.

### TRUCKS FOR SURVEY WORK.

The United States Coast and Geodetic Survey in carrying out some surveying work in the Northwest on primary triangulation, employed trucks as a means of communication and for carrying the apparatus from place to place. This was the first time that motor trucks had been used in the work, but it is officially stated that they proved so successful that all hereafter engaged in such work will use them.

### FORD PLANT CLOSED ONE WEEK.

The Ford Motor Company's plant at Detroit, Mich., was closed during the week preceding Christmas, for the purpose of helping to relieve the congestion in freight cars, according to a statement issued by Vice President F. L. Klingsmith.

While the plant was idle the production loss totaled 17,500 cars and 17,500 men were idle, involving a loss of wages of \$1,400,000.

### STUDY DELIVERY COSTS.

The results of the survey made in the city of Washington covering the subject of city cartage or local distribution of commodities, have been reported to Secretary of Commerce Redfield. The investigation, which was made under the direction of Director S. L. Rogers of the United States Census Bureau, confirmed the contention of the officials that the cost of deliveries constituted a considerable item in the amount paid by consumers for various commodities. In the preliminary survey made, which covered four selected classes, ice, coal, wood, milk and department store merchandise, it was found that the cost of delivering \$6,000,000 worth of these goods was \$500,000, or about eight per cent.

It is believed by the secretary that the results of this preliminary survey justifies the extension of the survey and some representative city or cities will be selected and experts detailed for the purpose of making a more comprehensive study of the subject of delivery costs in its relation to the price of commodities.

### S. K. F. PROMOTES TAYLOR.

S. B. Taylor has been elected vice president of the S. K. F. Ball Bearing Company of Hartford, Conn., to succeed F. B. Kirkbride. Mr. Taylor will also retain his duties as sales manager of the company and Mr. Kirkbride remains on the board of directors.

G. A. Unger, former representative of the company in Cleveland, Detroit and Pittsburg, has been appointed technical manager and chief engineer to succeed Mr. Uno Forsberg, who is going back to Sweden, having completed his work of creating the manufacturing organization of the S. K. F. Ball Bearing Company in this country.

### FULLER PLANT EXPANSION.

Plans are being made for an addition to the plant of the Fuller & Sons Manufacturing Company of Kalamazoo, Mich., maker of motor truck gearsets and clutches. The new building will be of concrete construction, four stories in height and 180 by 60 feet.

### NEW CADILLAC FACTORY.

The Cadillac Auto Truck Company of Cadillac, Mich., manufacturer of Acme one, two and 3½-ton trucks, is having plans prepared for an addition to its factory. The new building will be 86 by 176 feet, of concrete steel and brick construction.

### SMITH WITH BLAIR TRUCK CO.

The Blair Motor Truck Company, Newark, O., has announced the appointment of G. E. Smith as sales manager. J. P. McCune and F. O. Spaulding have been appointed managers of the factory, in place of F. L. Swanberg, who resigned.

### MAXWELL ONE-TON TRUCK.

The Maxwell Motor Company has announced the new Maxwell worm driven one-ton truck, which will sell for \$160 f. o. b. Detroit. Three body styles will be fitted to the chassis, a cupboard express body, a screened express body and an open flareboard express body at \$80, \$85 and \$45 respectively. The chassis price includes lamps, horn, fenders, seat and other necessary equipment except the bodies, which are extra as quoted.

The chassis has a wheelbase of 124 inches and is fitted with a unit power plant, including a block type four-cylinder motor with 3½-inch bore and 4½-inch stroke. The power transmission is through a three-speed ratio gearset and a two-piece propeller shaft with two universal joints. The conventional type of worm gear is used with the Hotchkiss drive through the springs. The rear axle is of the three-quarter floating type. The front tires are 32 by three inches and rear 32 by 3½ inches.

It is expected that the trucks will be on sale at the Maxwell agencies and branches shortly after the first of the year.

### AUTOMOBILE SHIPMENTS.

The shipments of automobiles for the month of November were 17,250 car loads, as against 17,138 for the same period in 1915. This increase is looked upon as quite remarkable considering the acute shortage of freight cars.

The automobile freight cars, after being taken off the main lines, have been used for the shipment of other commodities and have not been returned to automobile territories, a fact which has made the automobile industry suffer in particular.

### LANDOVER TRUCK COMPANY.

The Landover Auto Truck Company has filed a charter at Dover, Del., to deal in and with attachments for automobiles and auto trucks. The company is capitalized for \$300,000 and the incorporators are Arthur W. Britton, Samuel R. Howard and L. H. Gunther, all of New York City.

### NEW SIGNAL SALESROOMS.

The Signal Motor Truck Company of New England, distributor of Signal trucks and Atlas delivery wagons, has opened a salesroom and service station at 949 Commonwealth avenue, Boston, Mass. The business is under the management of Fred C. Henderson.

### R. W. HUTCHINSON RESIGNS.

Rollin W. Hutchinson, Jr., has resigned from the Sterling Motor Truck Company, Milwaukee, Wis., and will vacate his office on Feb. 1 to take up a more active interest in the manufacturing enterprises with which he is now identified.









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